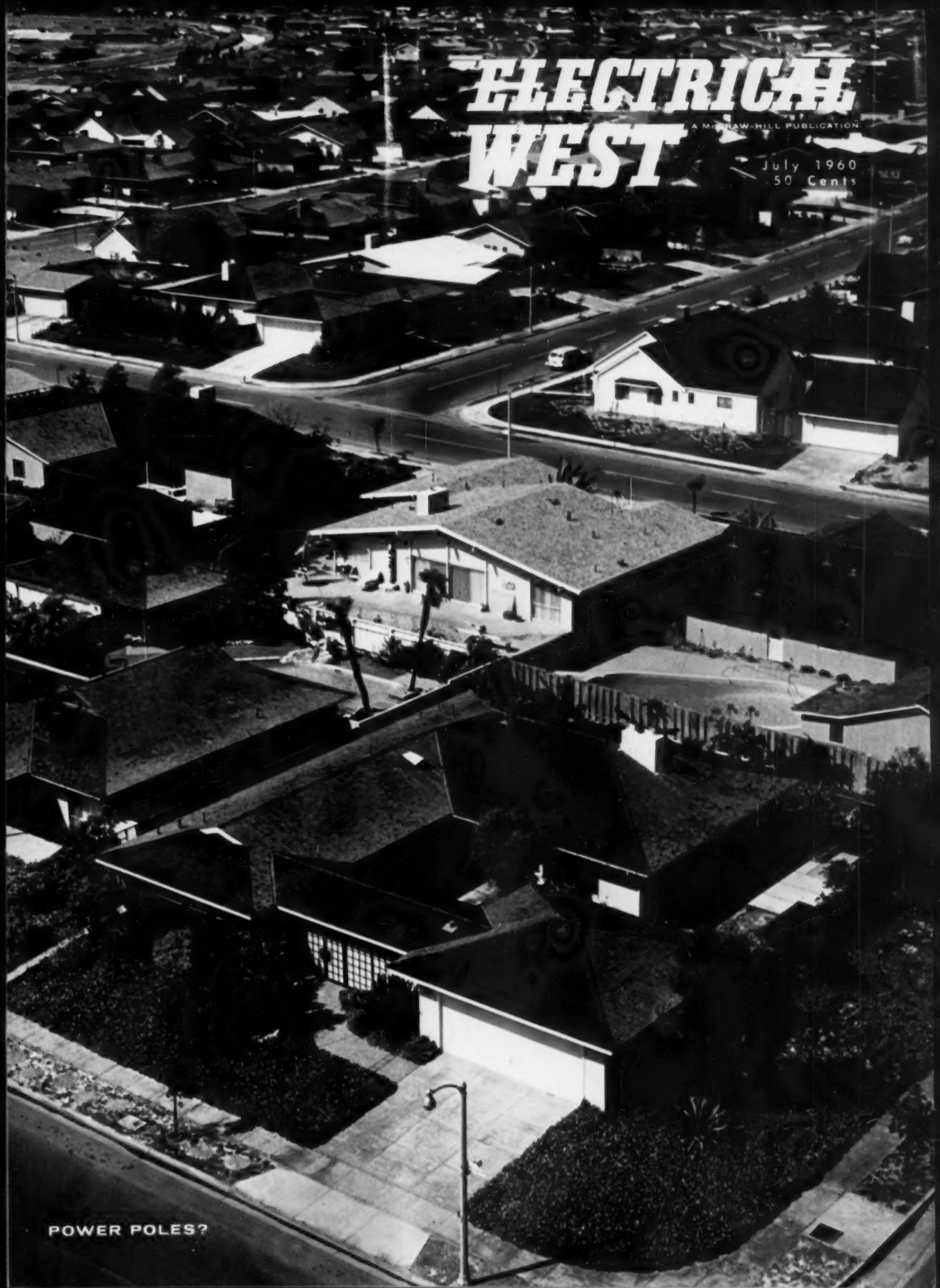

ELECTRICAL WEST
A McGRAW-HILL PUBLICATION
July 1960
50 Cents
POWER POLES?

REMEMBER
THIS
ADVERTISEMENT?
Where is the Guy who put up this guy?
STRANDVISE is made for strand sizes 3/8", 1/4", 5/16", 3/8", and 7/16" NO MATTER THE GRADE.
Please pick your size, fill in the coupon and mail it today.
Reliable
Reliable Electric Company
West Detroit Avenue
Chicago 10, Ill.
This STRANDVISE guy was put up complete before any tensioning tools were applied to the strand
We found the missing Guy...
Here he is,
doing another job
with Strandvise...
in 5 short minutes and
all by himself!
This man knows the safest, fastest, easiest way. He has deadended his guy at all points. It is complete, but slack. NOW he applies tension . . . and NOT UNTIL NOW. Tools have never been in his way.
Reliable
ELECTRIC COMPANY
11333 Addison Street • Franklin Park, Illinois
A Symbol of Integrity Since 1909

editorial views

Advisory Board

Pacific Southwest Region

J. F. Davenport, Executive Vice-President
Southern California Edison Co., Los Angeles
R. H. Cockfield, General Sales Manager
Department of Water & Power, Los Angeles
Joseph Pengilly, Vice-President
Square D Co., Los Angeles
Leonard Hobbs, Vice-President
Smoot-Holman Co., Inglewood
H. C. Gerster, Manager, Western Zone
General Electric Supply Co., Los Angeles
Sidney Hill
Hill Electric Co., Los Angeles
C. M. Smith, Sales Manager
Fluor Corp., Los Angeles
Victor Hartley, Managing Director
PCEA, Los Angeles

Northern California Region

Walter Maytham, Vice-President
Westinghouse Electric Corp., San Francisco
Norman R. Sutherland, President
Pacific Gas & Electric Co., San Francisco
Fred Nicholas
F. M. Nicholas Co., San Francisco
Alfred H. Meyer, President
A. H. Meyer Co., San Francisco
Arthur Dahl, Sales Manager
General Electric Supply Co., San Francisco
Paul Churchill, Regional Manager
Line Material Industries, South San Francisco
George Abbett, President
Abbett Electric Co., San Francisco
Karl Bausch, Chief Electrical Engineer
Bechtel Corp., San Francisco
Walter Bayha
Bayha, Weir & Finato, San Francisco

Intermountain Region

R. D. Moody, Manager
Allis-Chalmers Mfg. Co., Denver
David B. Hyer Jr., President
Southern Colorado Power Co., Pueblo
D. E. Provost
Stearns-Roger Mfg. Co., Denver
Ralph Johnson, Vice-President & General
Manager, Sturgeon Electric Co., Denver
Ken G. Eaton, District Manager
Anaconda Wire & Cable Co., Denver
Howard Peterson
Peterson Co., Denver
W. W. Bowman, Director of Publicity
Utah Power & Light Co., Salt Lake City
A. E. Fleming, District Manager
General Electric Supply Co., Denver

Pacific Northwest Region

Eric Nelson
Shafer & Nelson, Seattle
Ralph James
Northwestern Agencies, Seattle
R. B. Lane, President
Industrial Electric Co., Seattle
Beverly Travis, Consulting Engineer
Seattle
Eugene Starr, Chief Engineer
Bonneville Power Administration, Portland
Thomas W. Delzell, Chairman of Board
Portland General Electric Co., Portland
D. R. McClung, President
Pacific Power & Light Co., Portland
James F. Grieve, Vice-President
C. C. Moore, Engineers, Portland
Max Wood
Schwager-Wood Co., Portland
R. H. Sroufe, Executive Vice-President
Stubbs Electric Co., Portland
Alden F. Krieg, Managing Director
NELPA, Portland
Jack D. Stevens
Puget Sound Utilities Council, Seattle

PROGRESS THROUGH CHANGE

For many years the most potent tool for electric utility cost control has been standardization. It has made possible the use of mass production techniques and therefore has carried with it financial incentives. This has discouraged the unnecessary gewgaws and gadgets that result when each group exercises personal preference. The whole industry can well be proud of the record.

Standardize Up or Down?

In spite of the benefits, there has been one recognized drawback. The standardization has been done to allow the *lowest quality producer* to meet the standards with his standard commercial product. There are those who believe that standards should be built around the four or five highest quality producers. Then, by allowing a one-year delay between acceptance and effect, the substandard producer would have time to redesign.

There are two conditions that seem to reinforce these beliefs.

1. First, many equipment standards are badly out of date. Distribution breakers, for instance, with a standard interrupting time of eight cycles are woefully inadequate for today's systems.

2. The flood of new technology and new materials that is coming out of today's research efforts offers us exciting opportunities to continue to reduce the cost of electrical system components. For example, high temperature operation of electrical and mechanical components is being given vast amounts of study in the missile program. Out of these studies will come new ways to increase operating temperatures, reducing the size and cost of electrical equipment. But there will be no incentive to make the best use of these new technologies unless users insist on standards that lead rather than standards that lag.

The industry is now looking at a standards problem in the transformer field. Some manufacturers are stating that satisfactory life can be obtained by operating at temperatures above the standard 55 C rise. Thus, a "standard" 25-kva transformer has implied ratings from 25 to 35 kva depending on vintage, manufacturer and some private evaluations. This same situation existed when the 15-amp meter went to 200 amp! Turbine-generator ratings are a bit of a science.

How can you operate a system with elastic ratings?

Some Standards Guide Lines

1. Standards should be established by users. Manufacturers' recommendations are invaluable, but they should not set standards. Perhaps EEI needs a standards lab.

2. If we are going to continue to get benefits from standards, users are going to have to assign competent technical people to work full time on the study and development of standards.

3. Standards procedures must be streamlined.

4. Standards should have a time limit, i.e., a one- or two-year period of effect, after which time the committee must vote to reinstate it.

5. An effort must be made to reward research-oriented manufacturers by building standards around the best available designs.

*Trademark

Fine Fanner Superformed Products

"Superforms* help me insure Uninterrupted Service" ...TRANSMISSION ENGINEER

"Superforms help me accomplish my Number One Job Function:

"Keeping millions of dollars worth of equipment in constant service for many thousands of customers."

Transmission Engineers not only must know the requirements for their lines . . . they must also see that they are met. And, they have found that Fanner Superformed products are always reliable. A-1598A

FANNER Superformed* with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S. Established 1887

George C. Tenney, President
C. W. Leihy, Publisher
W. A. Cyr, Consulting Editor
Peggy Boyer, Associate Editor
Miriam Stuart, Editorial Assistant
Jack Robinson, Editor
Marvin Petal, Pacific Southwest Region
Frank Pitman, Intermountain Region
Ray Bloomberg, Pacific Northwest Region

CONTENTS

VOL. 125, NO. 1 JULY 1960

Underground Cost Comparison by R. C. Blankenburg 65
Direct Burial Residential Underground by A. T. Johnson and Orin F. Zimmerman 68
Air Break Switching Applications by H. J. Erling 71
Residential Underground Uses Plastic Conduit by W. W. Brawn 74
Helicopter Trims Costs on Reinsulation Job by W. P. Cunningham 76
Lease or Buy? 79
Disconnect Requirements at Remote Motors by Tom Hughes 80

DEPARTMENTS

Bulletins 102
Construction News 77
Editorials 1
Letters to the Editor 4
Meetings Calendar 9
News 54
Product News 96
Advertising Index 103

Cover—New residential tract in Southern California. Photographed by Joe O. Fadler from Southern California Edison's helicopter.

ADVERTISING REPRESENTATIVES
ATLANTA 3: R. K. Burnet, Rhodes Haverty Bldg.; CHICAGO 11: W. C. McMurray Jr., 520 N. Michigan Ave.; PITTSBURGH 22: Don Farris, 4 Gateway Center; DALLAS 1: James R. Pierce, 901 Vaughn Bldg., RI 7-5117; DENVER 2: John Patten, 1700 Broadway, AL 5-2981; HOUSTON 25: Gene Holland, W-724 Prudential Bldg., JA 6-1281; LOS ANGELES 17: Russ Antles, 1125 W. Sixth St., HU 2-5450; NEW YORK 36: Francis X. Roberts, 500 Fifth Ave.; SAN FRANCISCO 4: T. H. Carmody, Advertising Sales Manager, Bob McGinnis, Dick Alcorn, Bernice Johnston, Advertising Production Manager, 68 Post St., DO 2-4600.

Offices: Boston, Cleveland, Detroit, Philadelphia, St. Louis

Electrical West (with which is consolidated The Journal of Electricity), July 1960, Vol. 125, No. 1. Published semimonthly except November when published trimonthly by McGraw-Hill Company of California, James H. McGraw (1860-1948) Founder. Office of publication, 235 N.W. Park Ave., Portland 9, Ore. See panel below for directions regarding subscriptions or change of address.

Executive, editorial, circulation and advertising offices: 68 Post St., San Francisco 4, Calif. Donald C. McGraw, chairman of the board; George C. Tenney, president; John W. Otterson, vice-president; Thomas H. Carmody, secretary and treasurer.

Position and company connection must be indicated on subscription orders. Send to address shown in panel below. Subscription price includes the regular monthly issue, the news letter issue and the November directory issue. United States subscription rate $3 a year, single copies 50c (November directory issue $1); Latin American Republics and Philippine Islands $4 a year; Canada $3.50 a year; all other countries $4 a year. Entered as second class matter, Dec. 17, 1956, at the post office at Portland, Ore., under the act of March 3, 1879. Printed in U. S. A. Title registered in U. S. Patent Office. © Copyright 1960, McGraw-Hill Company of California. All rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, Electrical West, 68 Post St., San Francisco 4, Calif. Allow 30 days for change of address.

Postmaster: please send notice 3579 to Electrical West, 68 Post St., San Francisco 4, Calif.

SERIES ABS

"Sky-Master"

HYDRAULIC AERIAL BEAM

That's right, with the Series ABS Sky-Master workmen can reach out-of-the-way areas quickly and work on or near energized phase lines in complete safety.

Outer beam of the Series ABS is an extra-strong Spirex tube which withstands dielectric testing far in excess of normal requirements. Reinforced plastic work basket has no current-conducting parts or projections . . . provides ample work space and toe room for the operator.

Control levers beside work basket are connected to those on the mast by direct linkage, giving the operator a positive "feel" not possible with secondary hydraulic control-actuating systems.

Dielectric, reinforced plastic rods are installed in the control linkage and basket leveling mechanisms to electrically isolate the basket from the ground.

Modern way to work on energized high voltage lines

The Series ABS is fully-hydraulic in operation, powered by a pump driven by a power take-off on the truck transmission. Outer beam movement in an operating arc of 270 degrees and inner beam movement through a 110-degree arc is independently controlled. Mast can be rotated continuously in either direction. Safety devices prevent unwanted movement when controls are in neutral or if hydraulic system is damaged.

Maximum ground-to-basket floor height is 42′—enabling men to work safely and without fatigue up to 47′ above ground. Wide range of operation permits spotting of the work basket in limitless positions in any direction from the truck. The Series ABS, installed on a Powers-American Body that fits your work needs, can be furnished in two models; Series ABS-1-42 having one basket, Series ABS-2-42 with two baskets.

Another reason why
UTILITIES EXPECT MORE FROM

POWERS American

UTILITY BODIES AND EQUIPMENT

For descriptive literature and price information write . . .

McCABE-POWERS BODY COMPANY

5900 No. Broadway
ST. LOUIS 15, MO.

825 Cedar Street
BERKELEY 10, CALIF.

1461 E. Washington Blvd.
LOS ANGELES 21, CALIF.

5525 S.E. 28th Ave.
PORTLAND 2, ORE.

This CHANCE Fuse

waves a RED FLAG to signal Capacitor Failure!

... Prevents tank rupture

The Chance CTS Fuse for secondary systems gives you positive operation with a distinctive signal of capacitor failure. When the fuse element melts, the indicator flag springs away from the cartridge automatically ... stands out like a sore thumb so linemen and patrol crews can easily spot a failed capacitor from the ground. The fuse is equally effective on upright or underhung capacitors, and the flag works regardless of the position or angle of the fuse.

The fuse element is precision made and well protected by the rugged construction of the cap-sealed fuse tube. You get no false outages, but you do get instant isolation of failed capacitors to protect secondary systems *and prevent hazardous tank rupture.*

Ideal protection for banked secondary systems

Chance Secondary Fuses, used between banked transformer secondaries, permit only one transformer and its load to be taken out of service if a secondary fault occurs. This prevents possible damage to the other transformers, or cascading of the fuses protecting these transformers.

You can get complete information, and performance curves of the CTS or CTSI (Insulated Leads) Fuse, by contacting your Chance Man or writing direct.

CF60-23

A. B. CHANCE CO.

CENTRALIA, MISSOURI

(A. B. Chance Company of Canada, Ltd., Toronto)

LETTERS TO THE EDITOR

Action Editorial Brings Comment

To the Editor:

We attach copy of a letter directed to some of the Senators of the ELECTRICAL WEST area resulting from the "Action Editorial" appearing in the May 1960 issue of your magazine titled "The Colorado Storage Project."

We regret that you chose to completely ignore the views of the Colorado River Basin Consumers Power Inc., which represents preference users in the States of Arizona, Colorado, New Mexico, Utah and Wyoming. We provided you with our detailed engineering study and would have been happy in addition to have given you a statement of our position.

Fair journalism should have required some effort to present our position before exhorting your readers to take action.

Sincerely,

Marion M. Wilson, President:
Colorado River Basin Consumers Power, Inc.
802 Farmers Union Building
Denver 3, Colorado

Dear Mr. Wilson:

We have received your May 25 letter and appreciate your feelings. In honesty we must say that we anticipated your reaction. Your letter opens the door to a frank statement of our editorial views. We shall not miss the chance.

The editorial staff of ELECTRICAL WEST has and will oppose the needless federalization of the electrical industry. We feel that the case at hand is needless federalization. We deplore the preference clause.

We feel that organizations in the business of supplying power to the public should be subject to the same regulation, tax treatment, marketing privileges and financing as a private individual or corporation.

It is because of these principles that we initiated the action editorial.

Our magazine circulates among federal, municipal and private organizations. We laud and respect individuals on both sides of the fence. Our editors solicit material from both public and private organizations. It is our constant effort not to mix politics and engineering.

You claim that we have ignored your views. Our April issue gives you top billing on Page 9 of the News Section. Even though we disagree, we are glad to print your views.

For the record, 96% of the replies to date favor the five-company plan. Only 65% of these respondents are affiliated with the private companies, so you can see that there are many members of the industry, some from your ranks as well as trade allies, who feel the five-company plan is a fair one—fair for preference customers too. To give you the flavor of the response we have had a Notary select at random ten responses. They are included for your interest.

Jack D. Robinson
Editor

Here is how 10 readers, selected at random by a notary, responded to the questions: (1) My views with regard to a federal transmission grid tie are as follows; (2) I urge that you take the following stand in the forthcoming negotiations.

I am opposed to federal or state government on any business that competes with private business or free enterprise.

I urge the following stand: That private business build, operate and maintain transmission lines in any region that can be served by them.

Supervisor of Substations for a California Municipal

If private industry can do the job, it will save the taxpayers money and at the same time will pay taxes on the private investment in the future. We have about reached the limit of personal and corporation tax burden.

Let the private utilities construct those lines they propose to build at their expense.

Area Sales Manager for a Manufacturer —Colorado

1. Private industry can and does do a job more economically and as good or better than government bureaus.

2. Private industry has and is always ready to cooperate with government bureaus. I urge that you take the following stand in the forthcoming negotiations:

Colorado River Project: Accept and incorporate the public utilities in these projects in order to get adequate power distribution at a reasonable price—also assist in refund of government monies.

Supervising Inspector—New Mexico

[A federal transmission grid tie is] the very best possible way to obtain for the people the greatest amount of electric power at the greatest savings to them, and furthermore I get damn sick and tired of you so-called "electric magazines" promoting such trash as was stated in your "rag."

Be sure and deduct your cost of printing this "propaganda."

A USBR Official—Colorado

A federal grid is NOT necessary NOR desirable as long as private enterprise is able and willing to provide the necessary interties.

I urge: Do not approve any lines that will parallel existing or planned lines of any ownership.

System Engineer for an Oregon Municipal

I oppose it along with all other attempts to convert our system to socialism.

I urge: Emphasize the need to oppose the trend toward the socialist state.

Transmission Specialist for a National Distributor—California

Where private utilities are willing and able to furnish services, the government should not enter into competing business.

Do all that you can to further prevent

expenditure of taxpayers' money to endow the government in business enterprise.

Engineer of Consulting Engineering Firm—Massachusetts

Government ownership would have to be paid out of taxes rather than producing tax income; would discourage expansion of power facilities by competitive free enterprise.

It is simply not economically sound for the government to own businesses which would flourish more productively under competitive free enterprise.

Sales Engineer for a Manufacturer—New York

My view: . . . That the offer of the private utilities companies to build a transmission grid to connect with the Glenn Canyon project should be accepted. This would reduce federal construction expense by $90 million and increase federal, state and local taxes.

I urge the following stand: That the USBR would construct only 1,050 miles of transmission lines costing 42 million, and would not duplicate existing or planned private transmission lines.

Utility Division Manager—Nevada

Transmission lines built by private utilities must pay a dividend, otherwise they will not be built. Both the investment and the profit derived therefrom produce tax revenue for the state and federal government.

Block or curtail any further expansion of the utility business conducted by government agencies such as USBR, REA and the "Authorities."

Utility Supervisor—Arizona

Price and Value

To the Editor:

May I congratulate you for your continuing editorial sponsorship of Sound Business Practices with respect to the price and value of products used by our electrical industry.

Too many salesmen and too many executives on both sides of the desk have apparently lost sight of the points stressed in the second paragraph of your editorial, "Sequel," appearing in the June issue of ELECTRICAL WEST.

The ability to think clearly and express thoughts without fear is something we need more of in our country. For your contribution, I congratulate you, and urge your continued support of the subject.

Ray Waggoner
Vice-President—West Coast
Hubbard & Co.

Forgotten?

To the Editor:

In your News Letter of May 15, 1960, one article states that Reddy Kilowatt, in joining with Pacific Gas and Electric, will now be on the sales staff of all invester-owned utilities west of the Mississippi. Are you forgetting Portland General Electric. . . .

PAUL G. SCHAMP
Portland, Ore.
Pacific Power & Light Co.

Reader Schamp is correct. Portland General Electric Company does not use Reddy Kilowatt.

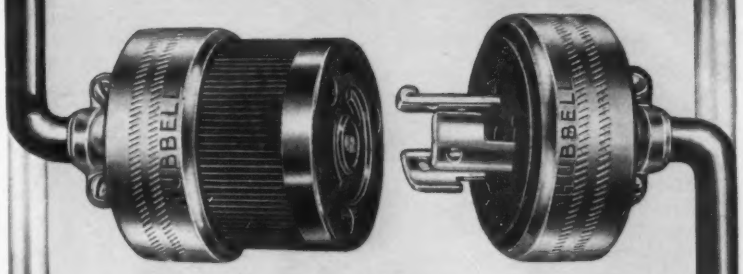
—Editor

ONLY

HUBBELL

MAKES RUGGED

Twist-Lock®



CAT. NO. 7313
3-WIRE CONNECTOR BODY
20 AMPS., 250 VOLTS, A.C. OR D.C.
10 AMPS., 600 VOLTS, A.C.

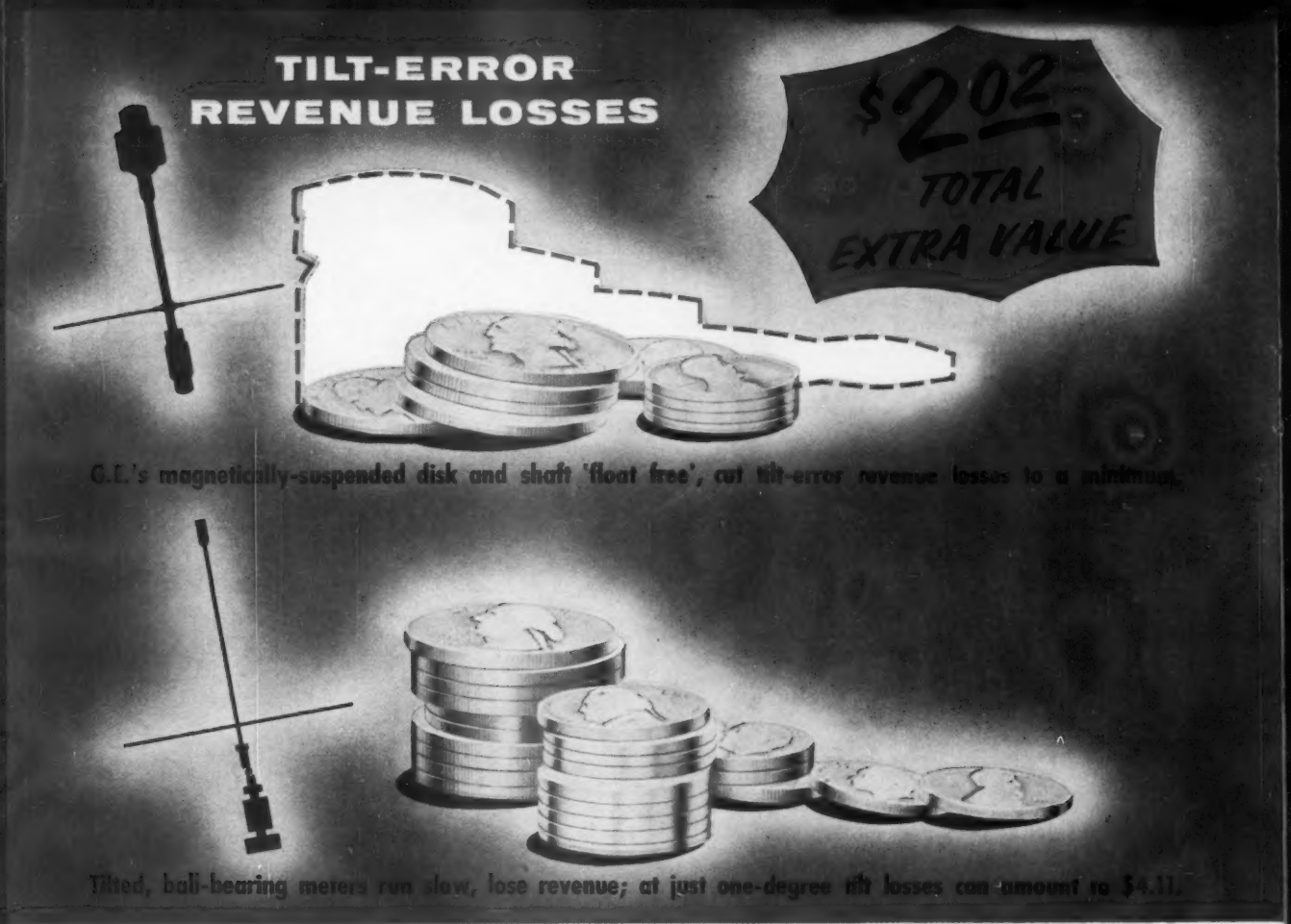
CAT. NO. 7311
3-WIRE CAP
20 AMPS., 250 VOLTS, A.C. OR D.C.
10 AMPS., 600 VOLTS, A.C.

Ever since it was first invented and introduced by Harvey Hubbell, Inc. back in 1930, "Twist-Lock" has provided greater convenience, safety and efficiency in the operation of motor driven tools and other portable electrical apparatus. The locking action insures positive contact in spite of rough treatment, heavy vibration and other conditions that might cause down-time.

Today, "Twist-Lock" is supplied in types, sizes and ratings to fit every industrial and commercial application. Units are available in 2, 3, 4 and 5-wire sizes. Every cap and connector body from 10 ampere to 50 ampere is available with "Seal-Tite" rubber covers for weatherproofing purposes, protection from dust and dirt, or from hard knocks and rough usage. Regular "Twist-Lock" units are supplied grounded and not grounded. Special non-interchangeable grounding types provide protection for 15 ampere, 125 volt or 277 volt applications.

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

HARVEY
HUBBELL
INCORPORATED
BRIDGEPORT 2, CONNECTICUT
In Canada: Scarborough, Ontario


TILT-ERROR
REVENUE LOSSES
$2.02
TOTAL
EXTRA VALUE
G.E.'s magnetically-suspended disk and shaft 'float free', cut tilt-error revenue losses to a minimum.
Tilted, ball-bearing meters run slow, lose revenue; at just one-degree tilt losses can amount to $4.11.

Today's purchase of each General Electric I-60 meter provides . . .

Up to $2.02 in EXTRA VALUE because

Each General Electric single-phase magnetic suspension meter put in service today can increase gross revenue up to $4.11 in just 30 years by greatly reducing tilt-error losses . . . here's proof:

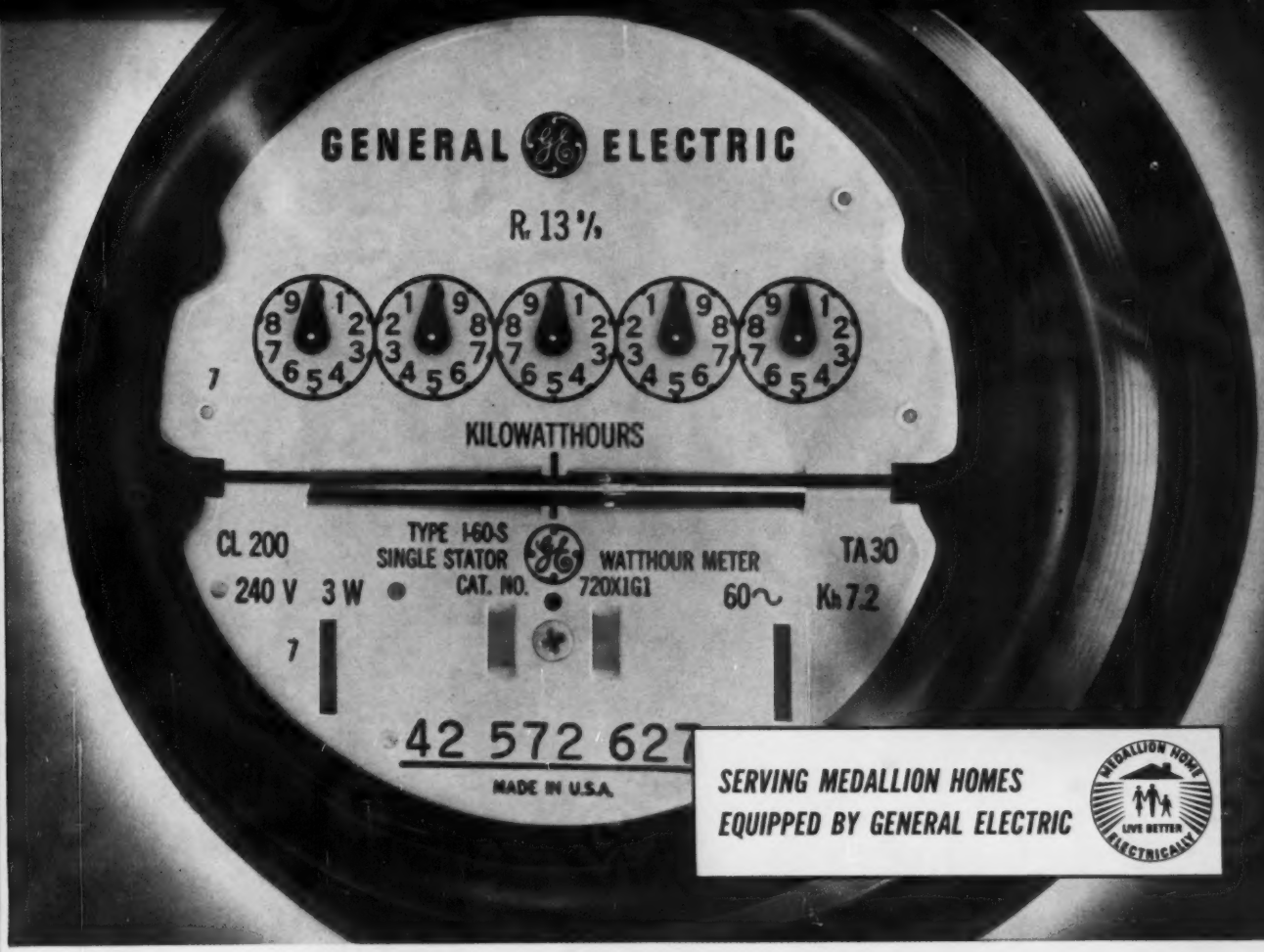
Old-style, ball-bearing meters lose revenue when operating in a tilted position. Just how much you lose depends on the degree and angle of tilt and meter load.

For example: a ball-bearing meter at just *one* degree forward tilt—operating at a continuous average of 240 volts, 3.0 amperes—in just one year would lose 5.7 kwhrs *more* than a General Electric I-60 meter mounted in the same position. In 30 years, this loss would amount to a sizeable 171 kwhrs. Using *Electrical World's* forecast for price per kwhr over the next 30 years, the gross revenue loss would be $4.11. Considering the 'present worth' factor at 6% interest for each of the 30 years, the *conservative* extra value realized today with each G-E I-60 meter would be $2.02, at only one degree forward tilt. Much higher savings are realized at tilt errors of 2 to 6 degrees (see chart).

How many tilted meters are on your line? Each of these meters represents a possible revenue loss of $4.11—or more—*unless* you have G-E magnetic suspension meters which offer greatest protection against substantial tilt-caused losses. By magnetically-suspending the disk and shaft in G-E meters, friction and disk displacement—major causes of tilt losses—are minimized.

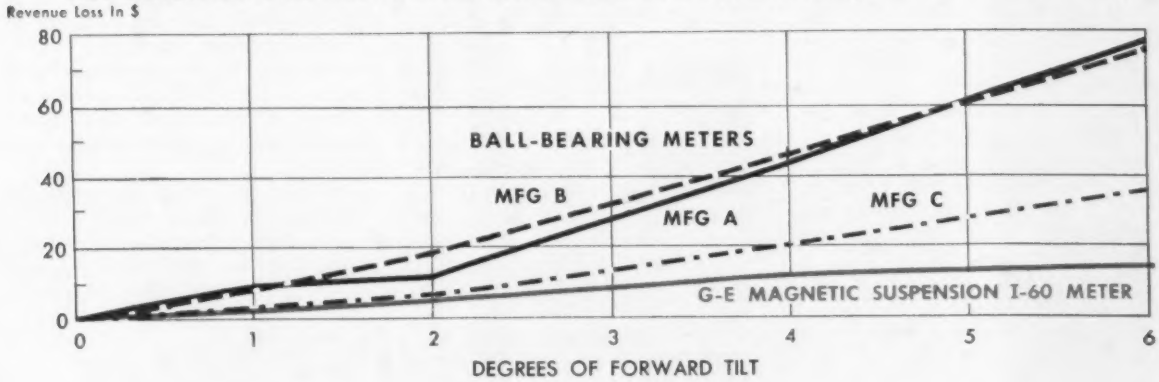
For the complete "extra value" story on General Electric meters, contact your G-E Apparatus Salesman, or write General Electric Co., Somersworth, New Hampshire. 713-02

In metering, anything less than the best is too costly



# of Reduced Tilt-error Revenue Losses

TILT-ERROR REVENUE LOSS IN 30 YEARS—Class 200, 3W, 240V, Single-stator Watthour Meters



METER DEPARTMENT

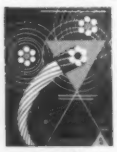
GENERAL ELECTRIC

for the latest data on ACSR

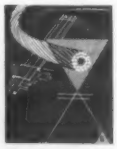
126 fact-filled pages...from Alcoa

It took more than 60 years to prepare these three publications.

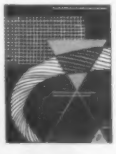
Recently completed tests have made it possible to review and revise data accumulated since 1897, the year Alcoa launched a continuous research program on overhead aluminum conductors— *both all-aluminum and ACSR*. The most up-to-date information has been put into book form to help you in your job:



Design or operation of transmission lines is your problem. Maybe you're called on to predict the resistance and reactance of a proposed transmission line. Are available data good enough? This 90-page book supplies you with new information on resistance and reactance—information that can help you accurately evaluate the effects of the steel core on electrical characteristics. TITLE: *Resistance and reactance of aluminum conductors.*



How much heat loss can you expect from convection? Tough problem. One that's complicated by the chimney effect of a heated conductor. And varying wind conditions. This 20-page publication provides up-to-date information on heat dissipation caused by convection and radiation. TITLE: *Current-temperature characteristics of aluminum conductors.*



Electrical requirements on your system go up. You need to operate conductors at higher temperatures than in the past. You ask yourself: what about creep effect? Here's a 16-page booklet that provides easy-to-use answers to many questions on how aluminum conductors behave when subjected to various conditions of heating by high overload currents. TITLE: *Overload and fault current limitations of bare aluminum conductors.*

Ask any one of our representatives for your copy of these new publications. Written requests on company stationery should be mailed to Rome Cable Division of Alcoa, Dept. 4-70, Rome, New York.

ALCOA
ROME CABLE DIVISION

For phone number of closest representative see advertising index in back of book.

Meetings Calendar

JULY

17-22—*Los Angeles Summer Market.*

21-22—*Edison Electric Institute-Rocky Mountain Electrical League,* Joint Industrial Relations Committee, Hilton Hotel, Denver.

24-29—*San Francisco Summer Market,* Merchandise Mart.

AUGUST

8-12—*American Institute of Electrical Engineers,* Pacific general meeting, El Cortez Hotel, San Diego.

23-26—*Western Electronic Show & Convention,* Memorial Sports Arena, Los Angeles.

SEPTEMBER

7-9—*Northwest Electric Light & Power Assn.,* 53rd annual meeting, Glacier Park Lodge, Mont.

7-10—*Rocky Mountain Electrical League,* annual meeting, Denver Hilton, Denver, Colo.

12-14—*International Association of Electrical Inspectors,* Northwestern Section, Sheraton-Portland Hotel, Portland.

14-15—*Northwest Public Power Assn.,* Accounting Section, annual meeting, Wenatchee, Wash.

18-24—*IAEI,* Southwestern Section, Mapes Hotel, Reno.

29-30—*NWPPA,* Power Use Section, annual meeting, Hotel Monticello, Longview, Wash.

OCTOBER

17-22—*National Association of Electrical Distributors,* Western Region convention, Stardust Hotel, Las Vegas.

23-27—*National Electrical Contractors Assn.,* national convention and exposition, Las Vegas.

NOVEMBER

14-15—*Pacific Coast Electrical Assn.,* Administrative Services Section, Phoenix, Arizona.

25-Dec. 3—*San Diego Bureau of Home Appliances,* annual Electric and Home Appliance Show, Electric Building, Balboa Park, San Diego, Calif.

DECEMBER

12-15—*Atomic Industries Exhibition,* Masonic Auditorium, AIF—Fairmont Hotel, ANS—Mark Hopkins Hotel, San Francisco.

JANUARY, 1961

16-20—*San Francisco Winter Market,* Merchandise Mart.

Lumatrol Mark I, Actual Size (NEMA Mounting)

LUMATROL® MARK I !

If highest reliability at lowest cost is your most important requirement in automatic street light control... *this is the baby that will do the job!*

Write for Complete Specifications

MICRO BALANCING, INC., Garden City Park, New York

In Canada: J. R. Kearney Corp., Box 270, Guelph, Ontario

...LONGER LIFE

NEW DURATHERM* INSU

DISTRIBUTION TRAN

INCREASED KVA CAPACITY

*Trade Mark

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20,

Extremely long life, even at high overloads, may be obtained from Moloney Distribution Transformers incorporating Duratherm, a new high temperature insulation. Transformers incorporating Duratherm will be available in single-phase ratings 167 KVA and smaller, and in three-phase ratings 150 KVA and smaller.

Duratherm is an insulating paper which has been especially processed during manufacture to reduce the rate of deterioration when subjected to high temperatures. This insulation is completely compatible with the other material used in the transformers.

This new insulation permits operation of the transformers at considerably higher hottest-spot temperatures than was formerly possible with standard kraft paper insulation. This means even better performance for Moloney Distribution Transformers which are already noted for their high overload capacity and long life.

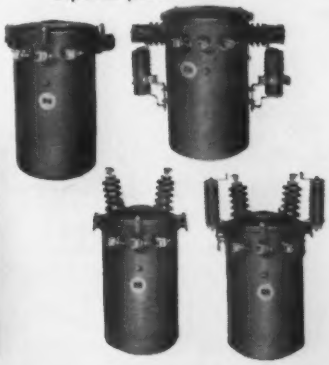
LATION FOR MOLONEY SFORMERS PROVIDES

The application of Duratherm insulation does not affect the basic design of the transformers. No change in losses, loss ratio or impedances is involved. Transformers with Duratherm will continue to have ASA Standard 55 C KVA ratings, but due to the high temperature insulation, will have an additional nameplate rating at 65 C average temperature rise. This additional rating will be 12% higher than the 55 C rating.

The cooling capacity of Duratherm-insulated Distribution Transformers will not be changed. Because of this, even when operating at the much higher overloads possible with these transformers, oil temperature will not be such that special high temperature oil will be required.

ME60-21

The increased KVA capacity and longer operating life resulting from the use of Duratherm insulation are but two of the many advantages to be obtained by using Moloney Distribution Transformers. Ask your Moloney representative for additional information on Duratherm and the other features of Moloney transformers which result in superior performance.



MOLONEY ELECTRIC CO.

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

MISSOURI, AND TORONTO, ONT., CANADA

For phone number of closest representative see advertising index in back of book.

A development of Orangeburg and Flintkote Research Laboratories, new *klean-kote* Orangeburg Conduit has a tough, non-brittle, protective coating for cleaner, safer handling. Ask your Wholesaler to show you a length now.

klean-kote* ORANGEBURG® *Fibre Conduit*

FLINTKOTE

Orangeburg Manufacturing Co., Orangeburg, N.Y. Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products

*KLEAN-KOTE IS A TRADE-MARK; U. S. PATENT APPLIED FOR. ORANGEBURG KLEAN-KOTE IS DISTRIBUTED BY GRAYBAR ELECTRICAL CO. AND GENERAL ELECTRIC SUPPLY CO. WITH BRANCHES AND STOCKS IN PRINCIPAL CITIES.

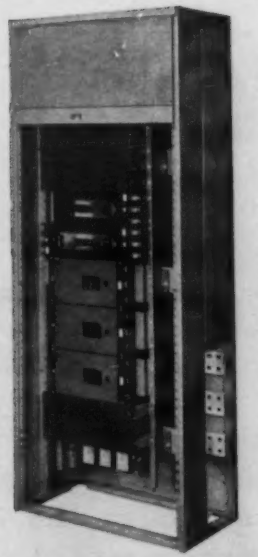
For phone number of closest representative see advertising index in back of book.

new "power-style" switchboards

with BUS-STACK design

solve the cost problem

of installation and wiring!



One of the biggest obstacles to efficient switchboard installation and wiring has been the tight working quarters with conventional horizontal cross-bussing. Problem: Limited working space, too many man-hours, excessive costs.

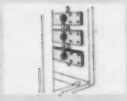
Now the problem has been solved by Square D with BUS-STACK design. All horizontal cross-bussing is stacked *vertically*, mounted near the back of the enclosure and out of the wiring gutter area! Result: clear working space for conduit stubs—wiring is faster and easier.

Square D "Power-Style" switchboards with BUS-STACK design reduce installation costs to a new minimum. Available now, as standard throughout Western United States.

OTHER NEW FEATURES OF "POWER-STYLE" SWITCHBOARDS:

- Standardized depth of 20" assures increased air circulation and cooler operating temperatures.
- Deep-formed corner channels provide additional side-gutter wiring space.
- Horizontal cross-bus location optional—top or bottom.
- Eliminates need for bussed riser section to transfer cross-bussing.
- Recessed panels—circuit-breaker operating handles protected against accidental breakage.
- Full length doors over breakers can be added in the field.
- Vertical bussing in standard ranges of 200 amperes to 1200 amperes or extended range of 1600 to 2400 amperes.
- Horizontal BUS-STACK cross-bus range from 600 amperes through 3000 amperes.
- Hinged front cover plates—over side wiring gutter areas for ease of inspection and maintenance.

CONVENTIONAL CROSS-BUSSING
Horizontal bussing hampers ready access to conduit stubs—Result: excessive wiring time and high installation costs.



NEW BUS-STACK DESIGN
Bussing is stacked vertically, leaving wiring area entirely open, unobstructed—fast, easy installation is result.

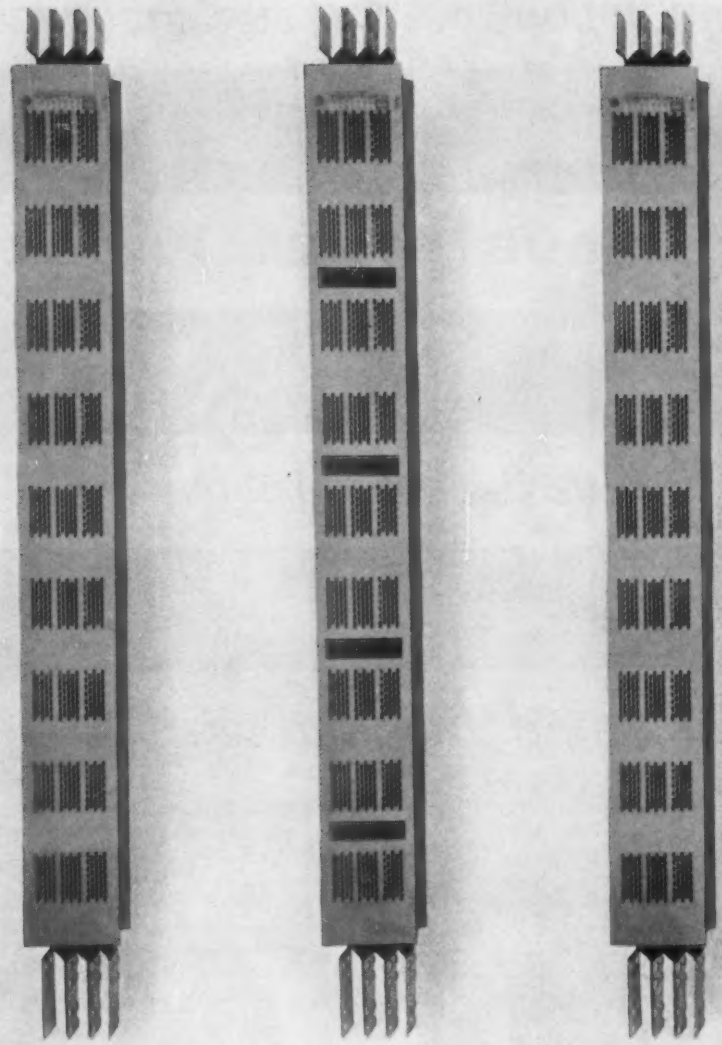
WHEREVER ELECTRICITY IS DISTRIBUTED AND CONTROLLED

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

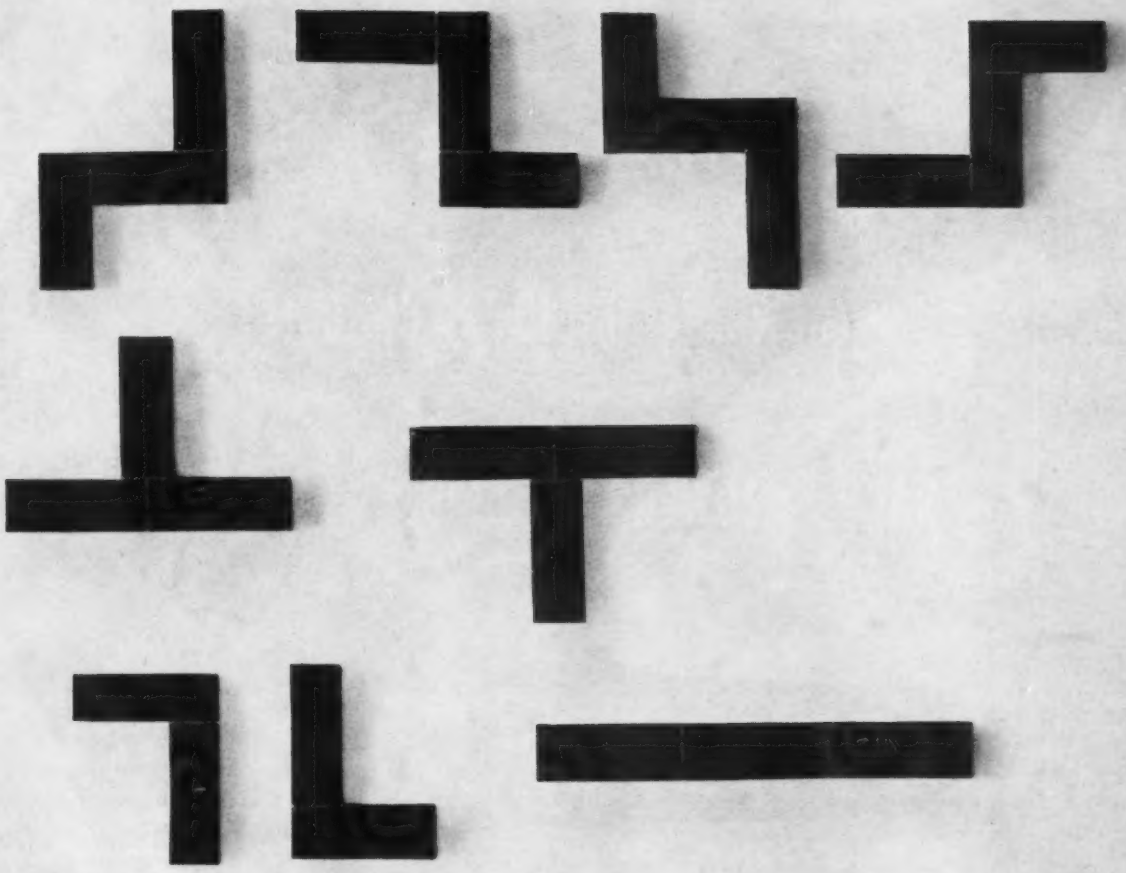
4335 VALLEY BOULEVARD • LOS ANGELES 32, CALIFORNIA

For phone number of closest representative see advertising index in back of book.



3 will get

Three straight lengths of FPE duct create all nine combinations shown – *right on the job.* Federal Pacific low impedance or low impedance plug-in ducts bolt together for tees, elbows and offsets in limitless application. And your savings are just beginning: no delivery delays... installation costs cut as much as 30%... flexibility and expandability multiplied several times over. What's



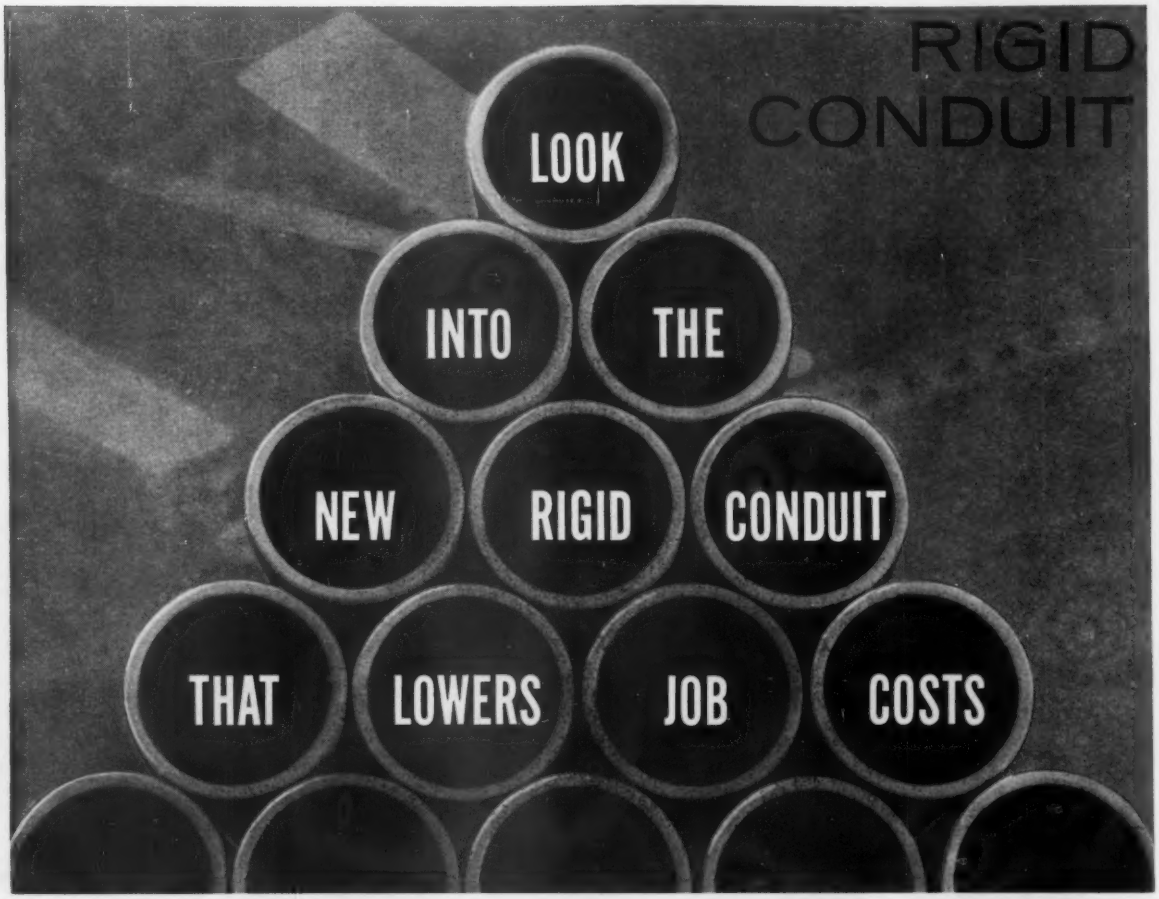
you nine

more, you can relocate in new layout, and again, no need to wait for factory fittings. All this because Federal Pacific designs bus duct on the modern modular principle, on all low-impedance, plug-in and weather proof duct. If you use duct – FPE is the only duct to use. Write for Bulletin 3-125, Federal Pacific Electric Company, Department FP-1, Newark 1, New Jersey

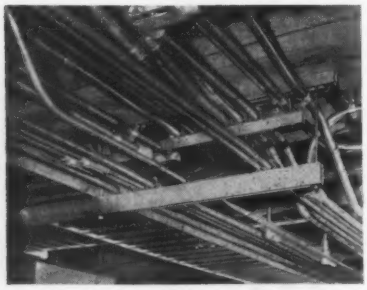
FEDERAL PACIFIC ELECTRIC COMPANY

FPE

growth through creative energy



New, from Harvey Aluminum—an easier-to-handle aluminum rigid conduit. High quality conduit in a complete range of standard sizes. The result of years of research to produce a special aluminum alloy—an alloy that gives the electrical industry all the desirable qualities needed for maximum conduit efficiency.



Harvey Aluminum Rigid Conduit offers the exclusive advantages of aluminum conduit over ordinary conduit—light weight, corrosion resistance, consistent attractive appearance, lower handling costs, nonsparking, and nonmagnetic. It is shipped with color-coded thread protectors to shield threads and speed up storage and handling. It makes wire pulling easier because all internal surfaces are uniformly treated and coated during manufacturing by an automatic device. Threads on both ends of all lengths and elbows have a special lubricant. All elbows have uniform cross-section.

Priced competitively with ordinary conduit, Harvey Aluminum Rigid Conduit improves performance and reduces handling and installation costs. Every section carries the Underwriters' Laboratories label of approval; meets and beats the specifications of the code on rigid conduit. Available right now *at established electrical supply distributors exclusively*. For additional details, write Harvey Aluminum, Torrance, California.

HARVEY Aluminum

A primary producer of quality aluminum in all alloys and sizes: Pig, ingot, billet, rod and bar, pipe, tube, hollow sections, press forgings, forging stock, hand forgings, impact extrusions, electrical bus bar, rigid conduit, structurals, special shapes, light and heavy press extrusions, screw machine and other aluminum products. Related products in titanium, zirconium, steel. Harvey Aluminum Sales, Inc., Torrance, California

For phone number of closest representative see advertising index in back of book.

GENERAL ELECTRIC ANNOUNCES . . .

A NEW METHOD OF TRANSFORMER RATING

DEVELOPED SPECIFICALLY TO LET
YOU TAKE FULL ADVANTAGE OF
THE BENEFITS OF GENERAL ELECTRIC'S
PERMALEX INSULATION

DISTRIBUTION TRANSFORMERS

NETWORK TRANSFORMERS

MEDIUM TRANSFORMERS

General Electric's new rating method gives you higher kva ratings, with full operating life, at no extra cost.

GENERAL ELECTRIC

Using General Electric's new transformer rating method, you utilize

Greater kva capacity with Permalex* insulation

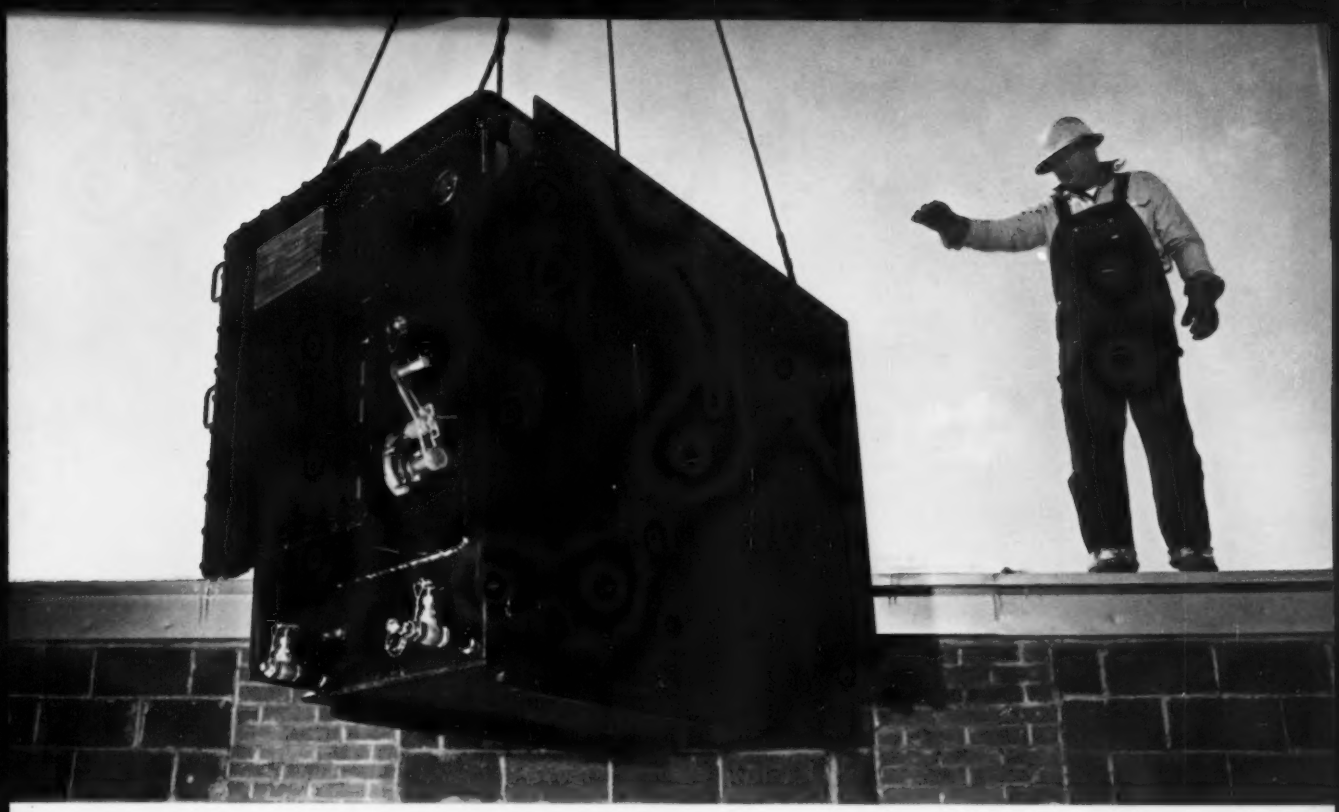
Permalex insulation was developed in G-E laboratories, and reported to the industry in AIEE paper TP-60-58 over a year ago. But standard rating systems have not permitted some users to fully realize the benefits of this outstanding insulation system — until today.

Now General Electric announces a NEW method of rating transformers, specifically designed to let you take maximum advantage of the higher kva capacity possible with Permalex insulation.

An additional higher kva rating now appears on G-E oil-filled distribution and network transformers.

*Trademark of General Electric Company

GENERAL ELECTRIC'S PERMALEX insulation gives you more kva — at lower cost-per-kva. Photo at left shows new 55° @ 65° label which identifies G. E.'s new dual-kva distribution transformer.



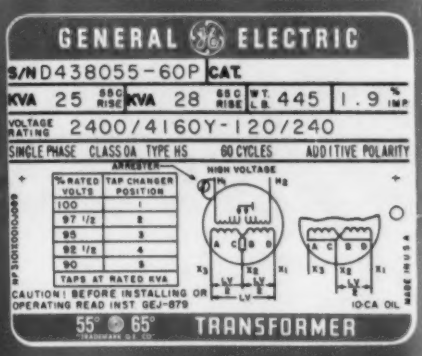
For example — a transformer formerly rated 25 kva is now rated 25/28 kva — indicating that you get the full benefits of a 28 kva unit from a General Electric transformer ASA-rated at 25 kva.

The nameplate is labeled 55° 65° to show the corresponding average winding rises associated with these two kva ratings. Here are sample ratings: 50 kva is now 50/56; 250 kva is now 250/280; and 750 kva is now 750/840 kva. Permalex insulation enables you to base your transformer utilization on the higher load and temperature with no sacrifice in transformer life.

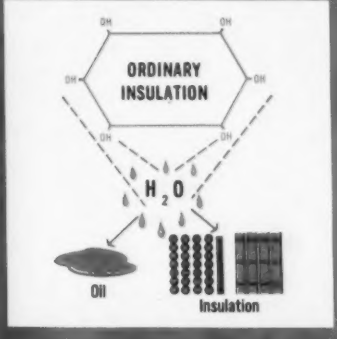
Using the new higher kva rating, you can now apply the full benefits of Permalex insulation *according to your established loading practices.* Since you get more kva capacity at no price premium, you can realize substantial savings on cost-per-kva.

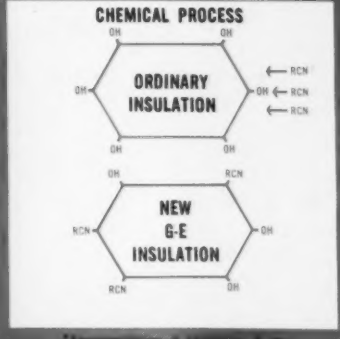
Your General Electric Sales Engineer can give you a dollars-and-cents breakdown of the actual savings *you* can get. Contact him today, or write for bulletin GEA-7047 to Section 482-05, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC



NEW NAMEPLATE shows ASA standard 55C rise kva rating, plus General Electric's new kva rating based on 65C rise — made possible by Permalex insulation.





HERE'S WHY Permalex insulation allows transformer operation at 65C winding rise. Chemically modified insulation in G-E Permalex system drastically reduces formation of water which attacks turn and layer insulation in ordinary systems.

FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
- Complete service

HERE ARE THE NEW RATINGS

	55C Self-Cooled	65C Self-Cooled	65C Fan-Cooled
1φ	833 kva	933 kva	1073 kva
	1250 kva	1400 kva	1610 kva
	1667 kva	1867 kva	2147 kva
	2500 kva	2800 kva	3500 kva
	3333 kva	3733 kva	4666 kva
	5000 kva	5600 kva	7000 kva
3φ	750 kva	840 kva	966 kva
	1000 kva	1120 kva	1288 kva
	1500 kva	1680 kva	1932 kva
	2000 kva	2240 kva	2576 kva
	2500 kva	2800 kva	3500 kva
	3750 kva	4200 kva	5250 kva
	5000 kva	5600 kva	7000 kva
	7500 kva	8400 kva	10500 kva

Permalex insulation now used in G-E medium transformers

General Electric now extends the use of Permalex insulation to medium transformers to give you 12 percent higher kva with continuous operation at 65C rise. You get this bonus kva at no price premium — and with no loss in transformer life expectancy.

For example — a G-E medium transformer with Permalex insulation, formerly rated by ASA at 5000 kva, 55C rise, can now be operated at 65C rise and 5600 kva with normal life. If you operate the transformer at ASA rating you get five times longer life. In addition, standard fan-cooled rating increments can be applied at 65C rise operation.

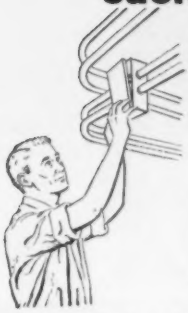
Your General Electric Sales Engineer has specific information on the savings you can realize with the new higher kva ratings — another Certified Full-value feature of General Electric medium transformers. Give him a call, or write for detailed information to Section 482-05A, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Here operator loads pay-off arm with a fresh coil of selected, precisely slit steel.

easier-working CIRTUBE* EMT begins right here with the finest steel!



All the care in the world can't make the kind of EMT contractors like working with — unless the steel's right in the first place.

New CIRTUBE EMT is made with the right kind of steel: specially selected, cold rolled, uniform in quality — and with just the right amount of carbon content for ideal working qualities.

But the right steel isn't enough — proper processing is needed, too. Circle's modern processes are designed to keep in the natural bendability of the high grade steels it selects to make CIRTUBE EMT. Result: tubing that can take it with just the right amount of workability.

Proper steel is only one of many reasons why new CIRTUBE EMT helps get faster, better looking wiring jobs.

Next time you order, try new CIRTUBE EMT — you'll like working with it. Now at your Circle wholesaler's.

*Trade Mark

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

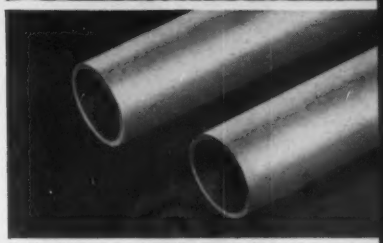
PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.



Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.

Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

ENJAY BUTYL

IS TOPS IN ALL-'ROUND

RESISTANCE TO CHEMICALS

Enjay Butyl, because of its unique and extremely low degree of unsaturation, offers excellent resistance to corrosive chemicals. The preferred rubber for tank linings, hose, seals, gaskets and other applications where exacting chemical resistance is required.

VIVID COLORS

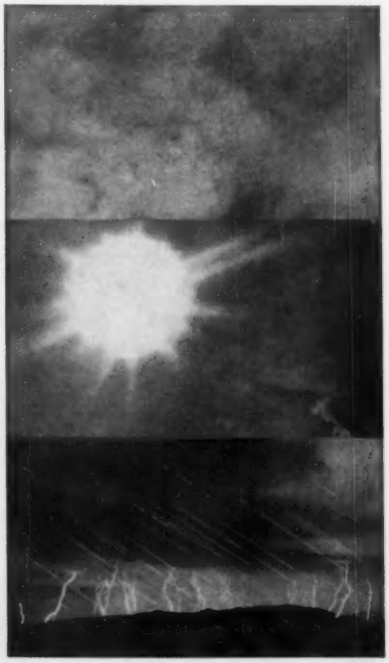
Enjay Butyl requires no additives for quality coloring over a wide range of hues. Famous for colorability and smooth finishes, Butyl has been successfully plastic coated for special applications.

RESISTANCE TO TEAR AND ABRASION

Enjay Butyl offers the highest aged tear strength of any rubber . . . even after long exposure to ozone and heat! Its inherent toughness resists abrasive wear, in such applications as tires, conveyer belts, hose and other mechanical goods.

RESISTANCE TO SUN-LIGHT AND WEATHERING

Enjay Butyl has proven its resistance to ultra-violet light, ozone, oxidation, moisture and mildew. Increases life of products such as weatherstrips, garden hose, wading pools and automotive parts.



RUBBER

PERFORMANCE

DAMPING PROPERTIES

Enjay Butyl absorbs shock and vibrational energy more completely than any other rubber. Resiliency can be varied in compounding and processing. Butyl is ideal for axle and body bumpers, motor mounts and sound-deadening applications.

IMPERMEABILITY TO GASES AND MOISTURE

Enjay Butyl is tops in impermeability to gases and moisture . . . retains air pressure 8 times better than natural rubber. Outperforms other rubbers in such application as inner tubes, jar and bottle seals, hoses and inflatable goods.

ELECTRICAL RESISTANCE

Enjay Butyl tops all vulcanizable rubbers in electrical and dielectric properties . . . in resistance to corona and ozone breakdown and water absorption. Its high dielectric strength insures against electric breakdown under normal or surge voltage. Its heat resistance permits higher current flow for a given conductor size.

The outstanding properties of Butyl Rubber create new horizons for the designer, and offer to manufacturers an opportunity to utilize the qualities of rubber in applications never before possible. The unique properties of Butyl have led to vast improvement in many existing products. Technical skills will open the way to countless new uses.

Butyl is the "idea" rubber with uses stretching as far as the imagination can reach. We'll be glad to tell you all about it. Just contact the nearest Enjay office.

HOME OFFICE: 15 West 51st Street, New York 19, N. Y. OTHER OFFICES: Akron • Boston • Charlotte • Chicago • Detroit • Houston • Los Angeles • New Orleans • Tulsa

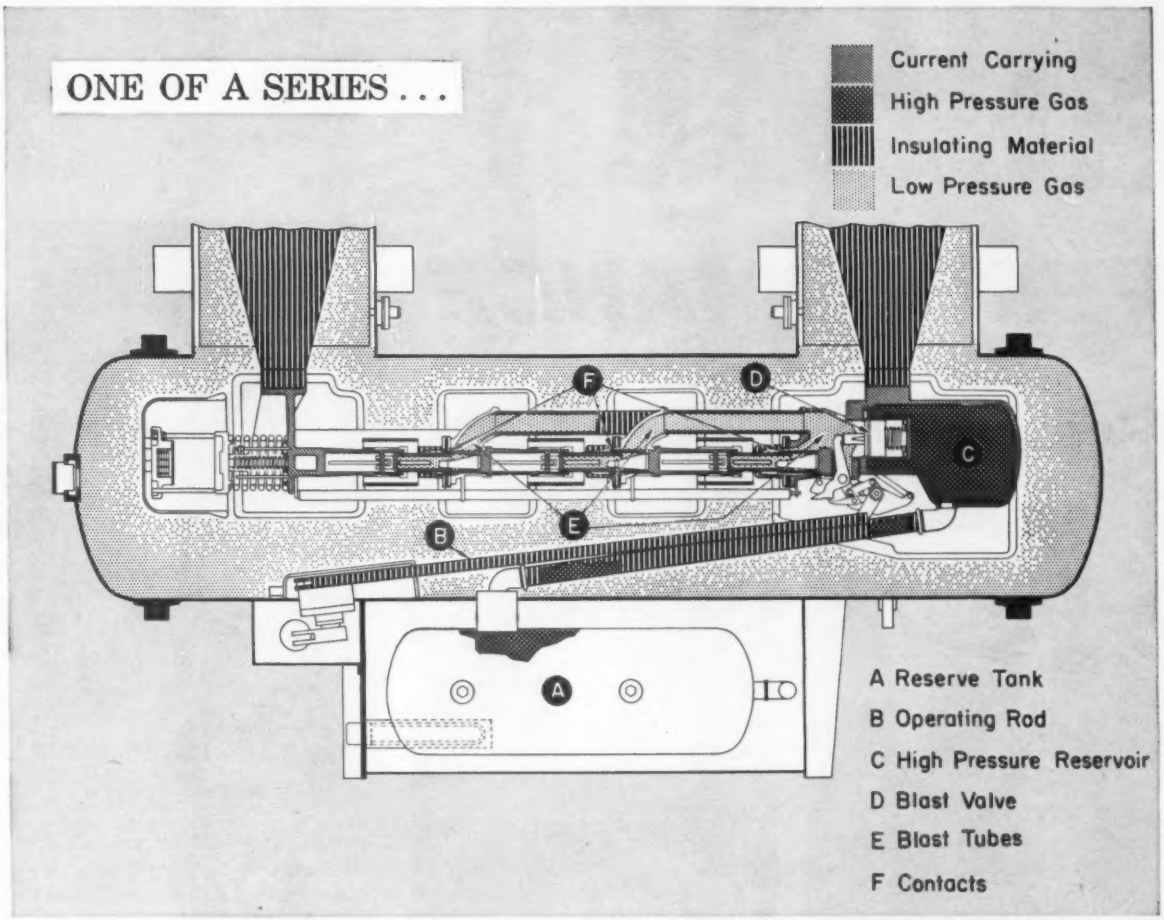
EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY® BUTYL

For phone number of closest representative see advertising index in back of book.



A uniform 45-psig pressure is maintained in the gas-filled pole units. Contacts in all interrupters are *opened* simultaneously by a spring accelerator. They are closed by a pneumatic mechanism, proved in years of oil breaker service.

Initial movement of the contacts opens a blast valve in the high-pressure reservoir within the pole unit, at right. SF_6 gas is directed from the high-pressure reservoir to the interrupting orifices at 220 psig to snuff out the arc.

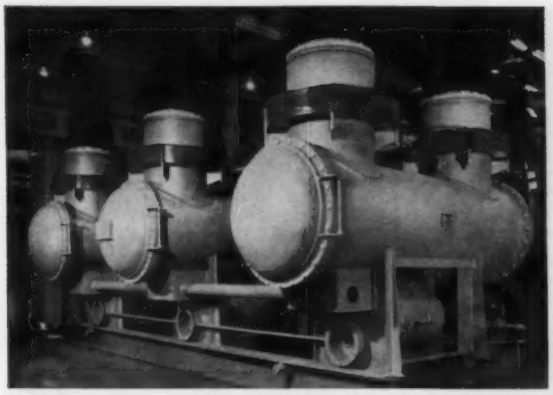
Design of new type SF_6 Gas Breaker extends operating life, slashes maintenance, reduces installation cost

Provides improved performance from 69 to 460 kv and beyond

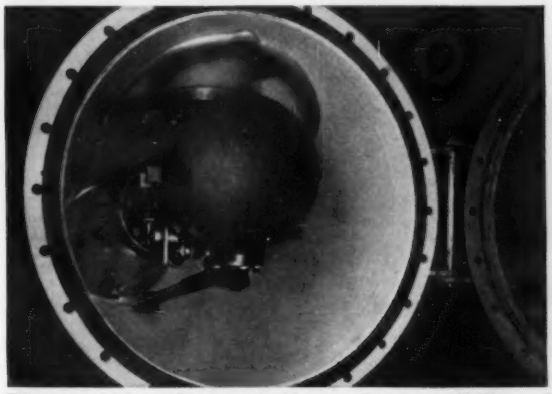
The most advanced power circuit breaker in industry today is made possible by the unique properties of the SF_6 gas interrupting medium. Remarkable dielectric strength, high recovery rate and long life of the gas, coupled with the minimum arc erosion of interrupter contacts, give the Westinghouse breaker greatly increased service life. Periods between routine inspections are *at least* twice as long as for other breakers.

Advantages of the breaker's compactness are easy to see at installation time. Ratings up to 230 kv can be shipped fully assembled to most locations on the unitized base, ready for mounting on a concrete pad. Breaker weights have been cut to *less than* ½ those of comparable oil breakers in many ratings.

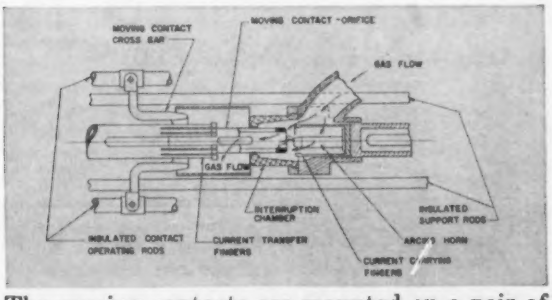
The SF_6 gas system under 45 psig is completely



self-contained to conserve the gas and provide quiet operation. High-pressure reservoirs at the end of each unique horizontal interrupter supply SF_6 gas at 220 psig to the individual interrupting chambers. Reserve capacity is assured by individual high-pressure tanks beneath each pole unit. Capacity is sufficient for four operations without pump operation. The breaker operating levers to the three poles are mechanically linked to provide synchronization of all contacts.

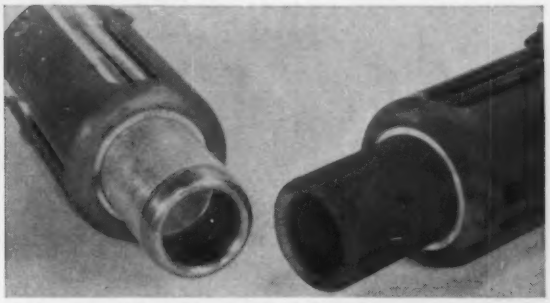


The opened tank reveals the ready accessibility of the entire interrupter. Unique insulating properties of SF_6 permit this compact design with minimum live-part to tank clearances. Bottom pipe feeds high-pressure gas to blast reservoir. Smaller rod operates breaker contacts.



The moving contacts are mounted on a pair of parallel insulating pull rods for simultaneous operation. Contact fingers of both the moving and stationary contacts are silvered cupaloy for maximum conductivity. An arcing horn inside the stationary contact absorbs the brunt of arc action. The hollow moving contact, designed to minimize arc erosion, is also faced with special arc-resistant material.

Actual interruption is contained within a teflon chamber. High-pressure gas blasts the arc between the contact surfaces and flows through the hollow moving contact . . . out ports in the side, into a Micarta® shield.



This shot illustrates the effectiveness of the new Westinghouse interrupter design. The contact at right evidences minimum erosion after 45 interruptions of between 24,000 and 45,000 amperes . . . equivalent to over 36 operations at breakers rated 37,500 amperes.

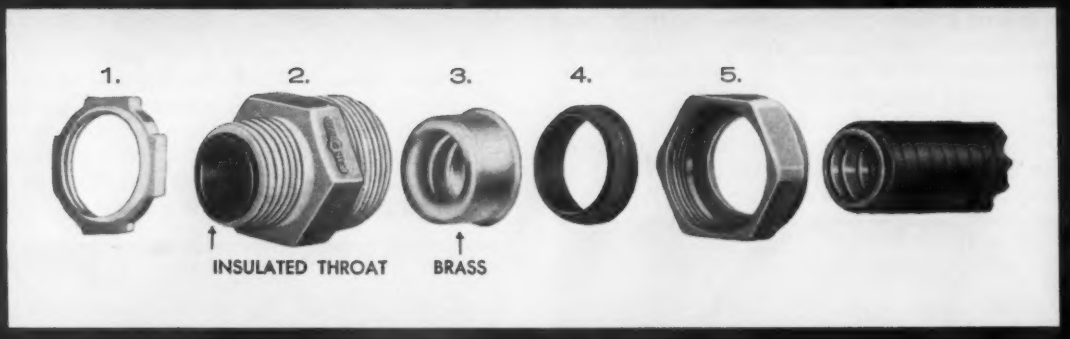
SF_6 gas has unique properties that give it exceptional arc quenching ability. In this demonstration, a high-voltage arc, readily drawn in an air-filled tube, is quickly extinguished by injecting a small amount of SF_6 gas. Sulfur-hexafluoride's electronegativity causes it to absorb free electrons . . . provides an extremely high rate of recovery of dielectric strength. Arc space is converted from a relatively good conductor at current zero to a good insulator in a few millionths of a second.

To learn more about the money-saving features of this product, call your Westinghouse sales engineer or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-61001

YOU CAN BE SURE...IF IT'S
Westinghouse
TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

BEST NEWS YET IN LIQUID-TITE CONNECTORS

Gedney insulated throat for top protection, easier pull-through



MALLEABLE IRON

Now you can order Gedney Liquid-Tite Connectors with the added protection of insulated throats. You get faster, easier pull-through . . . eliminate dangerous wire fraying. Gedney Liquid-Tite Connectors are the finest, most efficient connectors available for use with liquid-tite conduits. They're precision-made from top grade malleable iron . . . designed to give lifetime dependable service in oil- and water-tight flexible raceways.

Gedney Liquid-Tite Connectors are supplied in standard sizes from ⅜" to 2" . . . straight, 45° or 90° . . . with or without insulated throats. Be sure . . . specify Gedney.

As shown from left to right in illustration, Gedney Liquid-Tite Connectors consist of:

1. Locknut — nut stock steel — cadmium-plated.
2. Main fitting — straight, 45° or 90° angle — malleable iron — cadmium-plated. Insulated throat — optional.
3. Grounding brass bushing — 1 piece — threaded to engage spiral of all type conduits.
4. Molded Vinylite sealing ring — pliable — ever-lasting.
5. Gland nut — malleable iron — cadmium-plated.

GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY

GEDNEY

AMERICAS BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

For phone number of closest representative see advertising index in back of book.

The Pole Star® Distribution Transformer Core has a new ECHELON LAP

result:

- LOWER LOSSES
- LOWER EXCITING CURRENT
- LOWER IMPEDANCE
- IMPROVED REGULATION

When the Pole Star lap-on-top core was introduced by Pennsylvania Transformer in 1947, its electrical efficiency represented a major improvement over previous standards for distribution transformers. This leadership has been maintained for more than a decade.

Now, Pennsylvania again takes a long step forward—by giving the Pole Star core a "new look" that reduces total losses as much as 9%, and exciting current as much as 46%. The new design also provides improved regulation, and lower impedance.

New Compact Design Retains Service-Proved Principles

In the new, patented design, the lamination laps (still on top of the core) have been arranged in an "echelon" pattern that results in a highly compact, efficient structure with outstanding magnetic properties. Laminations nest snugly together, with no appreciable build-up of steel at the top of the core.

As in the original, time-proved Pole Star core, laminations are individually lapped as the core is built into the coil. Each lamination thus forms its own magnetic path, and no flux has to cross from one turn to the next.

Electrical Data Now Available

Use of the new "echelon" core is being extended throughout the entire line of Pole Star Distribution Transformers. For electrical data on specific units, write to Distribution Sales, Pennsylvania Transformer Div., McGraw-Edison Co., Canonsburg, Pa.

McGRAW EDISON

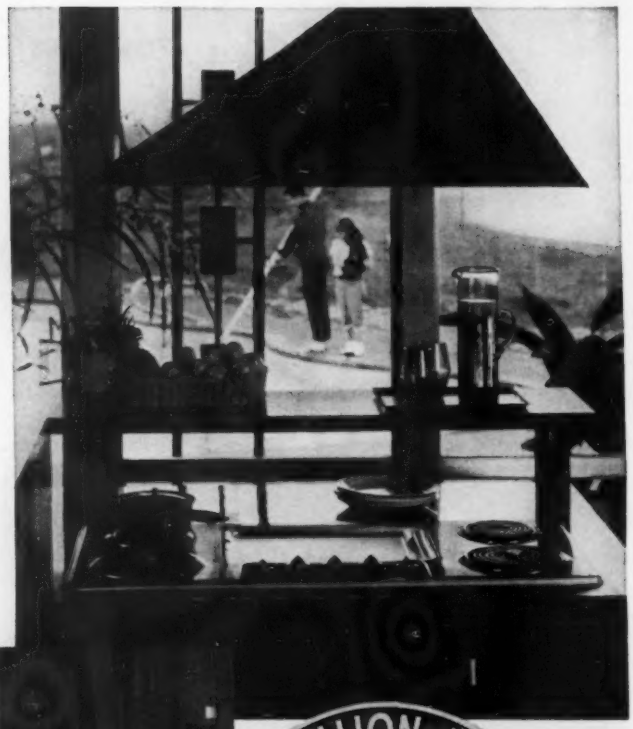
Example: 7200-volt line; average for all kva sizes

Characteristic	% Improvement over Previously Published Data
Total Loss	7%
Iron Loss	14%
Copper Loss	4%
Exciting Current	39%
Impedance	10%

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

For phone number of closest representative see advertising index in back of book.

A cool, clean electric kitchen is included in the purchase price of every Medallion Home



This is Mrs. C. R. Campbell of Fullerton, California, in her all-electric Medallion kitchen

MEDALLION HOME
LIVE BETTER ELECTRICALLY

Help for wives: An all-electric kitchen is at your service the moment you move into your Medallion Home. The latest range-and-oven gives you a *clean* helping hand, important free minutes, a kitchen climate that's 16° cooler. And your Medallion Home affords the creative lighting you've always wanted — assuring you comfort, beauty, safety.

Savings for husbands: The appliances in the all-electric kitchen of your Medallion Home are already taken care of in the basic home cost. And your home is thoughtfully planned for full Housepower — wired for tomorrow's power needs as well as today's. Further, a Medallion Home is a *wise* investment. For, in a future that's all-electric, your Medallion Home will remain electrically modern.

Beyond all this is the Gold Medallion Home — the ultimate in living better with electricity. It's completely electric. And you have a wide choice of new electrical home-heating methods. One is the amazing electric heat pump... it *cools* your home without water, ***heats*** your home without flame.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

ANOTHER STEP AHEAD IN VOLTAGE REGULATION

NEW Permalex Insulation

Permalex* coil insulation in General Electric voltage regulators boosts reliability—lengthens regulator life

New Permalex insulation—another regulator first from General Electric—is now standard on all G-E ML-32 single-phase, step voltage regulators. Permalex makes possible added regulator economies through longer core and coil life and greater reliability—at no price premium.

Permalex insulation preserves high dielectric strength because of the special cyanoethylation of its kraft insulation paper. This process, exclusive with General Electric, retards formation of moisture released by cellulose materials under load—slows aging process of insulation to give you longer regulator life. Permalex insulation is fully compatible with other regulator components and provides a true *system* approach to regulator design.

Another outstanding G-E regulator feature which increases quality, Permalex insulation gives you more regulator for your money. It is, in fact, another reason why *G-E regulators cost less on the line.*

Ask your General Electric regulator representative for more information about Permalex-insulated ML-32 regulators—as well as the entire line of G-E voltage regulators. Or, write to Section 456-03. General Electric Company, Schenectady 5, N. Y.

*Trade-mark of General Electric Company

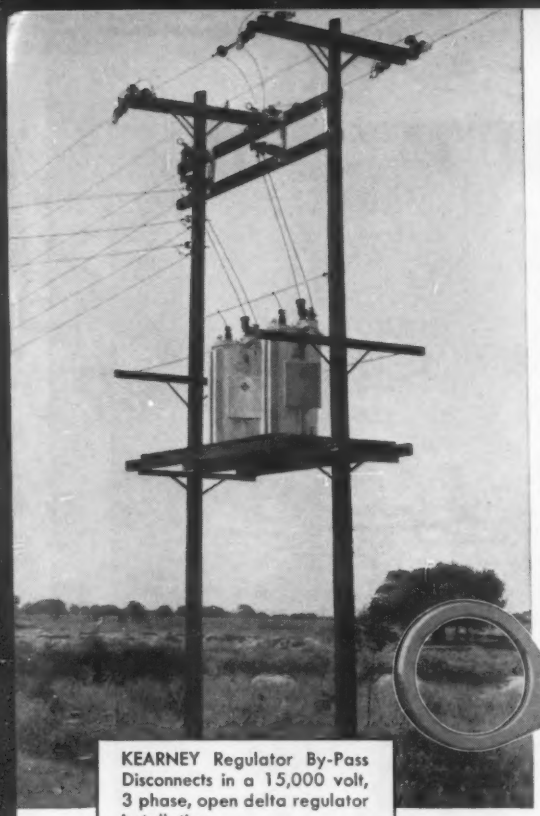
Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

Safe performance

of 4 operations in proper sequence assured by KEARNEY REGULATOR BY-PASS DISCONNECT



KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

JAMES R. KEARNEY CORPORATION, *General Offices:* **4224-42 Clayton Avenue, St. Louis 10, Missouri**

IN THE WEST: for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
Los Angeles • Seattle • Portland • San Francisco • Spokane • Phoenix.

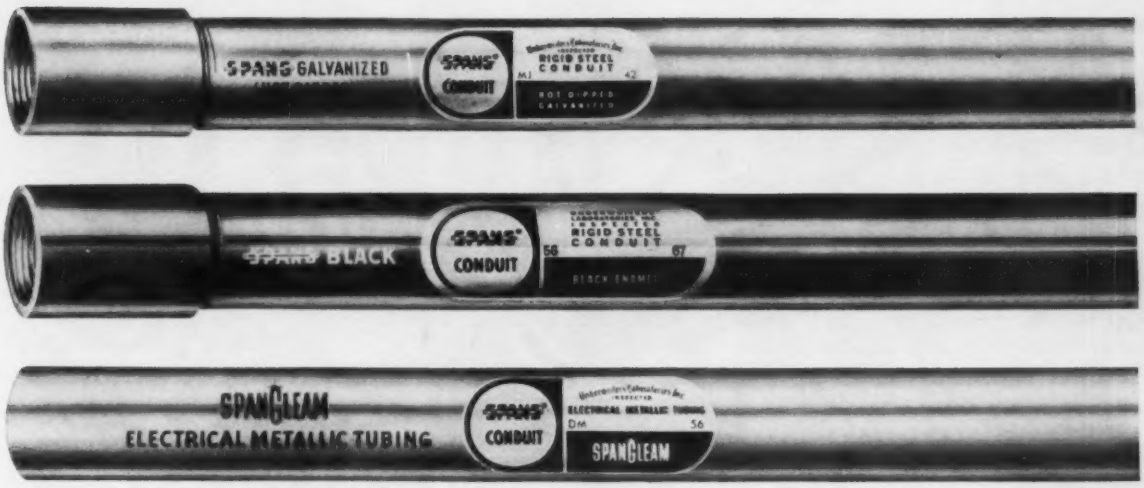
348

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

KEARNEY PRODUCTS

The Mark of Quality

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA



the top-quality SPANG® Conduit Line...

... of SPANG rigid steel conduit and electrical metallic tubing has earned a reputation over the years as the top-quality conduit line for fast, efficient, economical and trouble-free electrical wiring protection.

now includes SPANG® Aluminum Conduit!

Good news for you! SPANG now offers top-quality SPANG Rigid Aluminum Conduit to provide you with a new complete line of SPANG Conduit Products. SPANG Rigid Aluminum Conduit, Couplings and Elbows are available in a full range of sizes from ½" through 6".

SPANG rigid steel conduit, electrical metallic tubing and rigid aluminum conduit are all produced under strict quality-control methods, thoroughly tested and inspected before shipping, and packaged for convenience and safety—assuring you of a top-quality, uniform conduit for every type installation.

For those installations where engineering dictates the use of rigid aluminum conduit, you can now give consideration to SPANG Rigid Aluminum Conduit with the same confidence as you would consider any SPANG Steel Conduit product. They're *all* top-quality!

Your local SPANG Distributor is looking forward to providing you with one-stop service for all your conduit needs. He has the complete line of SPANG Steel and Rigid Aluminum Conduit Products, and he's always prepared to give you top-quality service. Give him a call!

SPANG® CONDUIT

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation ARMCO®

For phone number of closest representative see advertising index in back of book.

All suspension insulators and hardware are designed to work together.

But good design is only the beginning. Unless that design is faithfully reproduced in every part of every piece - - porcelain and metal - - the designed strength will never be fully realized.

At Ohio Brass we've been making porcelain for over half a century. We've been making our own metal components - - in our own foundry - - even longer. Here porcelain and metal aren't just designed for each other, they're *made* for each other.

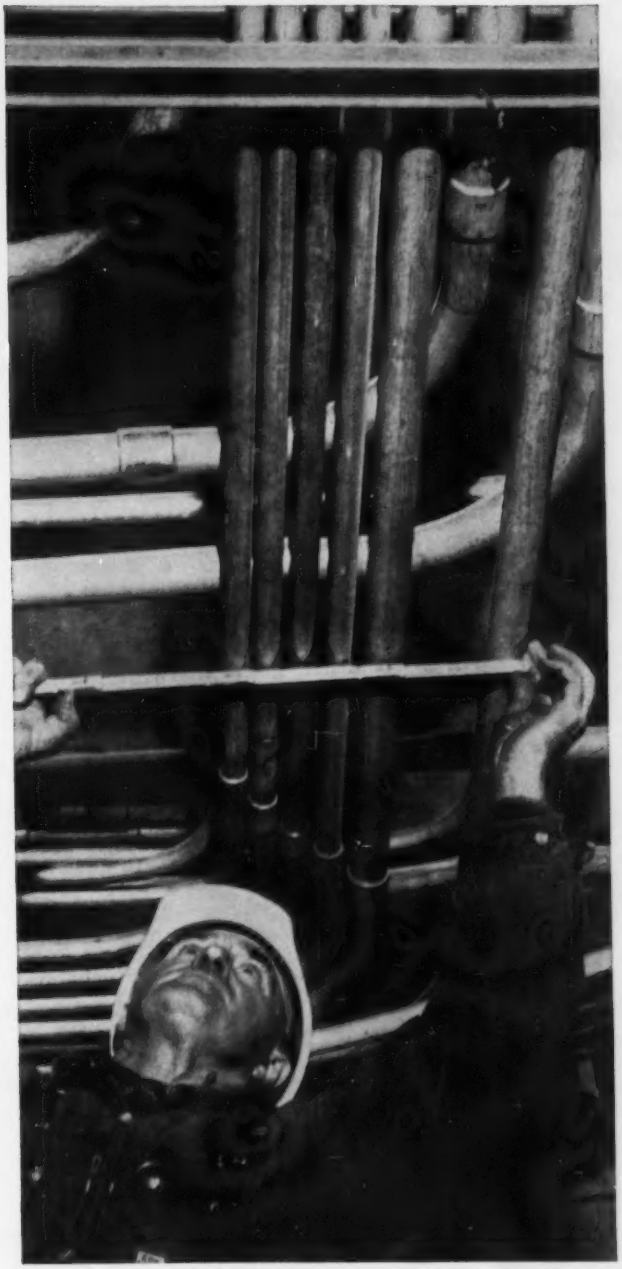
And if you're interested in service reliability, they're made for you!

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10022-H



REPUBLIC
RIGID STEEL
CONDUIT

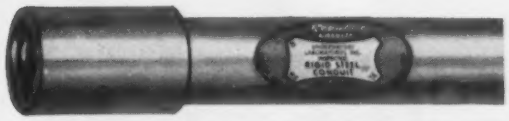
more profit every job...

Every Republic Rigid Steel Conduit installation puts more profit in your pocket, gives you a good looking job, saves time.

Made of highest quality, soft, ductile steel, and produced by Republic's famous continuous weld process, Republic Steel Conduit is delivered ready-for-the-job.

This high quality pays off in installation costs because of its uniformity, ductility, freedom from hard spots. Easy to use with clean, sharp, free-running threads, clean inside surface. Tight, hot-dipped galvanized finish will not flake, peel, or chip off.

If you want to make more profit on every job, see your electrical distributor for Republic Rigid Steel Conduit. Send for additional information.



GALVITE® RIGID STEEL CONDUIT (Blue Label) is a heavywall, hot-dipped galvanized conduit with a special coat of baked-on lacquer inside and out for greater corrosion-resistance and long life. **ENAMELITE®** Rigid Steel Conduit (Red Label) heavywall conduit is protected inside and out with a baked-on coating of tough, wear-resistant enamel for greater protection against moderate corrosive action.

This STEELMARK of the American Steel Industry tells you a product is made of steel. Look for it when you buy.

Steel

REPUBLIC STEEL
STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • DEPT. C-9841
216 EAST 131st STREET • CLEVELAND 8, OHIO

I want to learn more about Republic Rigid Steel Conduit. Please send complete information.

Name_____ Title _____

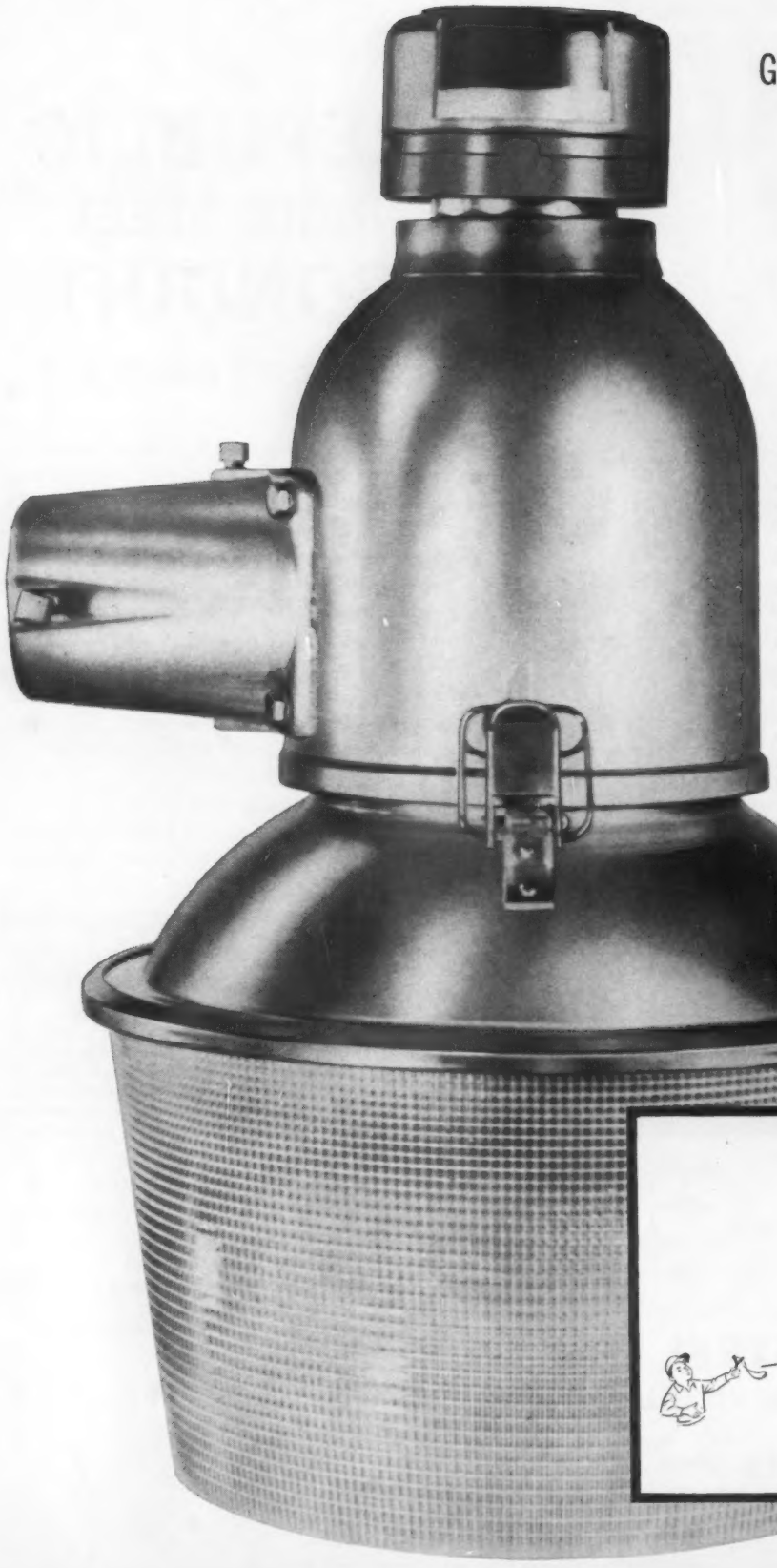
Firm _____

Address _____

City _____ Zone ____ State _____

GENERAL ELECTRIC'S

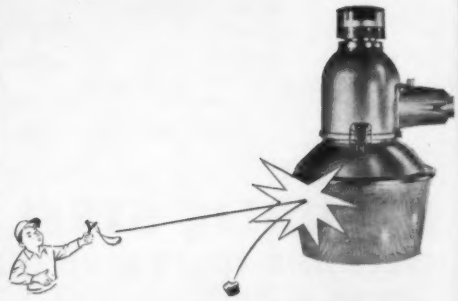
Boosts by



"PRIVATE-LIGHTING" PACKAGES Especially for "private-lighting" applications, General Electric offers the Acrylic-Suburban luminaire in attractively priced equipment packages:

Cat. No. C648G017– Acrylic - Suburban luminaire complete with cadmium-sulphide photoelectric control, acrylic refractor, hood with 175-watt built-in ballast (lamp not included), 4-foot aluminum bracket.

Cat. No. C648G016– Acrylic - Suburban luminaire complete with cadmium-sulphide photoelectric control, acrylic refractor, hood for up to 6000-lumen filament lamp, mogul base, 7-inch light center (lamp not included), 4-foot aluminum bracket.



BB's and stones bounce off

NEW ACRYLIC-SUBURBAN LUMINAIRE

"private-lighting" profits cutting maintenance costs

Exclusive shatter-resistant plastic refractor tops money-saving features

Here's a luminaire designed and built to keep your maintenance trucks in the garage, and your "private-lighting" accounts on the profit side of the ledger. It's the new General Electric Acrylic-Suburban.

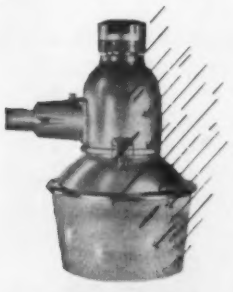
Realizing that repeated service calls can severely hamper any rural and suburban lighting program, General Electric has built into the Acrylic-Suburban these time- and money-saving features:

- The industry's first-and-only open refractor of durable plastic—virtually unbreakable in normal service—developed from General Electric's years of experience with acrylic refractors for mercury luminaires such as the M-250. This precision-molded refractor is more costly to make than glass and offers more resistance to all causes of breakage, yet you pay *no premium* in price. It has the same high transmissivity as glass, and is interchangeable with many standard glass refractors. One-fourth the weight of glass, it's far easier to install.
- General Electric's dependable cadmium-sulphide photoelectric control, which mounts right on the locking-type hood for automatic dusk-to-dawn operation. It's built and tested for years of reliable, trouble-free performance.
- Long-life ballasts built right into the hood for mercury lamps up to 250 watts (hoods without ballast for up to 6000-lumen filament). Since mercury lamps generally last two to three times longer than filament, this means far fewer service calls for relamping.

It all adds up to a luminaire you can install and forget. Whether it's for suburban streets, commercial establishments, or areas around private homes and farms, the General Electric Acrylic-Suburban can mean increased lighting profits for you. For full details and immediate shipment from stock, call your General Electric Apparatus Sales Engineer or Agent. General Electric Company, Outdoor Lighting Dept., Hendersonville, North Carolina. 460-01

Progress Is Our Most Important Product

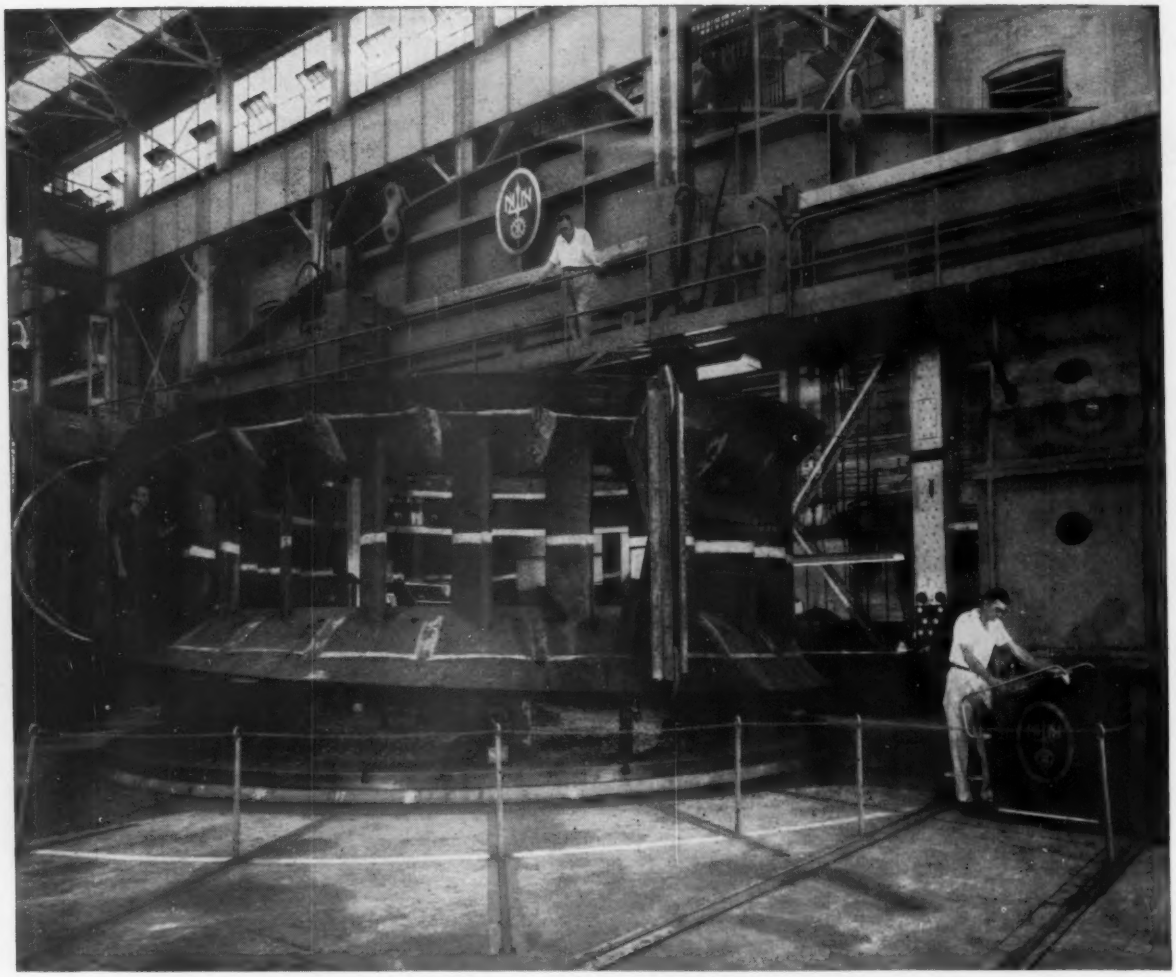
GENERAL ELECTRIC



resists thermal shock of cold rain

unaffected by corrosive atmosphere or blowing sand

.22 bullets penetrate but will not shatter



42 ft. boring mill-rough cuts a stay ring for one of the world's most powerful hydraulic turbines.

Newport News builds six king-size turbines for Niagara Power Project

These skilled Newport News machinists are milling a stay ring for one of six 200,000 hp. Francis-type hydraulic turbines. Before they're finished, they'll turn out five more turbines—the world's most powerful—for the Lewiston Power Plant of the Niagara Project.

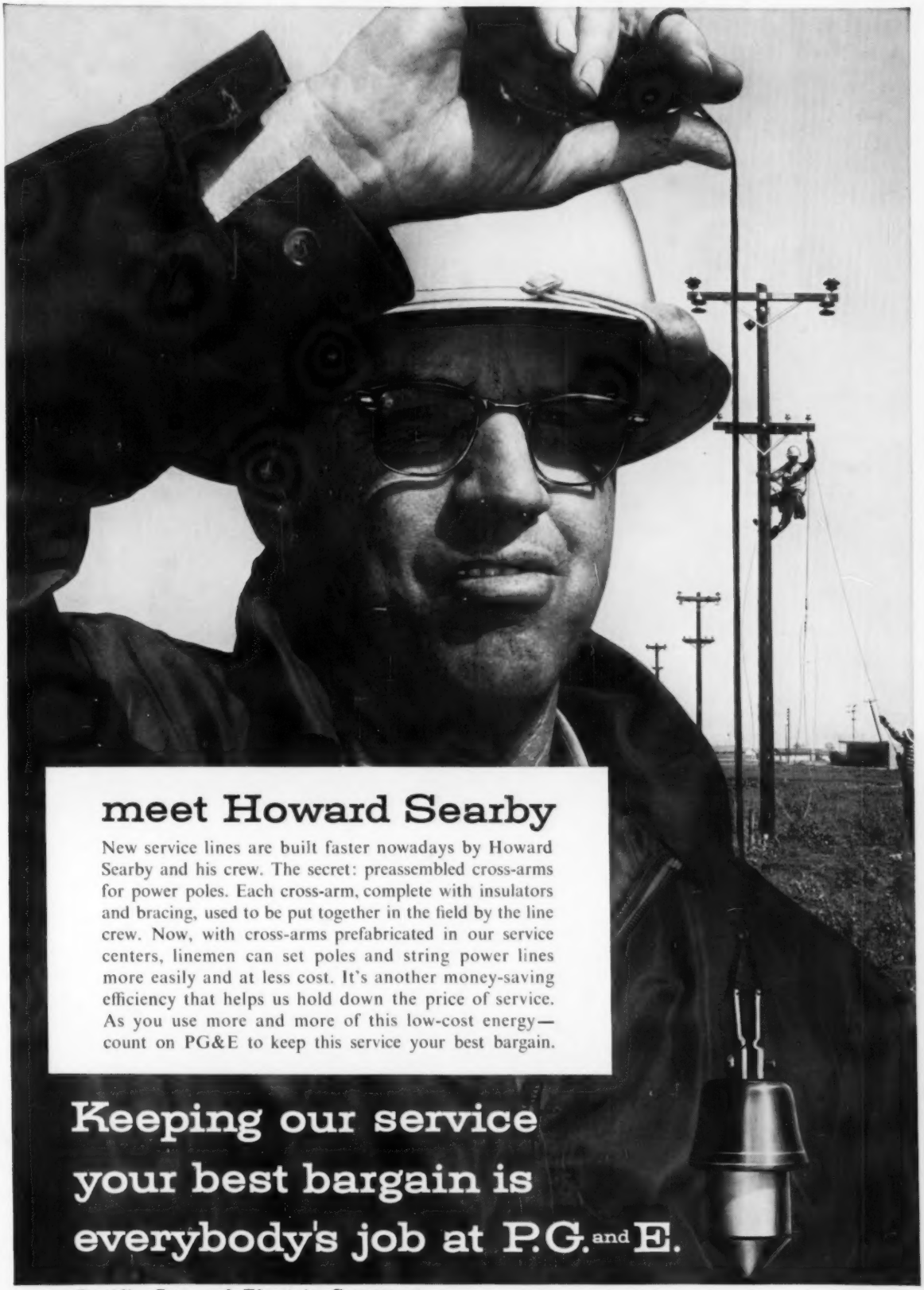
Newport News has not only the men, but the facilities to take a job like this in its stride . . . your job, too. For example, the 42 ft. boring mill pictured above was designed and built at Newport News.

The large engineering and technical staffs, acres of iron, brass and steel foundries, five huge machine shops, and additional specialized equipment make Newport News a leader in the production of hydraulic turbines, valves, gates, penstocks, and other water power equipment you need.

Consult Newport News engineers on preliminary design recommendations at no obligation.

Engineers . . . Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News
Shipbuilding and Dry Dock Company
Newport News, Virginia



meet Howard Searby

New service lines are built faster nowadays by Howard Searby and his crew. The secret: preassembled cross-arms for power poles. Each cross-arm, complete with insulators and bracing, used to be put together in the field by the line crew. Now, with cross-arms prefabricated in our service centers, linemen can set poles and string power lines more easily and at less cost. It's another money-saving efficiency that helps us hold down the price of service. As you use more and more of this low-cost energy—count on PG&E to keep this service your best bargain.

Keeping our service your best bargain is everybody's job at P.G. and E.

Pacific Gas and Electric Company

THE FASTEST, SIMPLEST, SAFEST WAY TO DEAD-END DISTRIBUTION CONDUCTORS

Philadelphia Electric Company lineman dead-ends 4/0 ACSR conductor with PREFORMED Aluminum Dead-End. The down guy is of ⅜ galvanized steel strand with GUY-GRIP dead-end.

Patented—U. S. Patent No. 2,761,273.

With *Preformed* TRADEMARK CABLED LOOP DEAD-ENDS

which OFFER YOUR COMPANY

1. The most economical Dead-End available
2. UNIFORMITY OF ALL APPLICATIONS
3. Elimination of high stress concentrations
4. Extra holding strength to withstand ice loading and ice dropping
5. Faster, safer application... with ONE-PIECE Preformed DEAD-END

WIDE AREA SUPPORT with continuous line carry

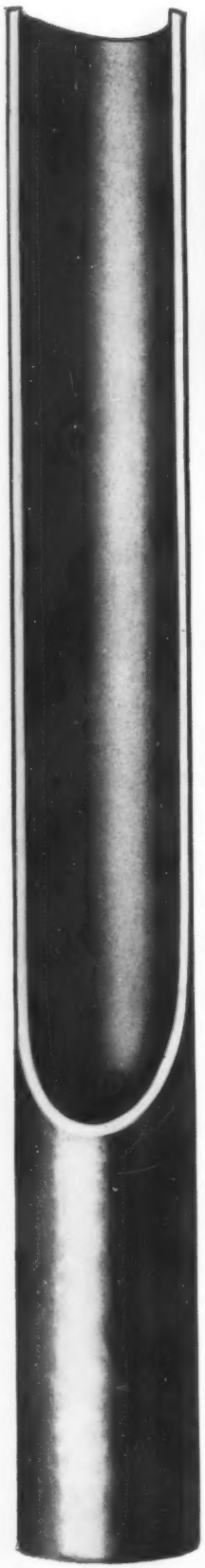
Write for Booklet-of-the Month "Another New Twist"

PREFORMED LINE PRODUCTS COMPANY
DEPT. DE-2

5349 St. Clair Avenue • Cleveland 3, Ohio • EXpress 1-3571
600 Hansen Way • Palo Alto, California • DAvenport 4-2561

PLP® is a trademark which is registered in the U.S. Patent Office and is the property of Preformed Line Products Company.

PREFORMED and GUY-GRIP are additional trademarks of Preformed Line Products Company.



SPECIFY CLIFTON CONDUIT

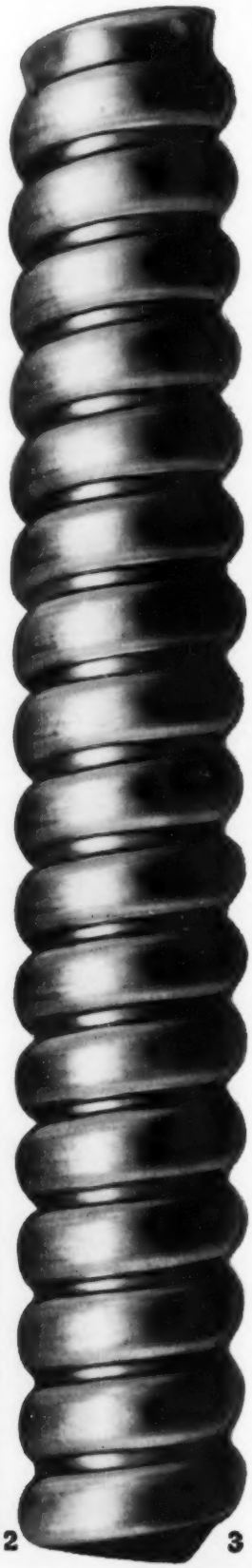
The conduit with built-in quality

1 **EMT** (Electrical Metallic Tubing) the only hot-dipped galvanized tubing—inside and out for complete protection •flat, clean, continuous weld for smooth interior surface and ease of pulling during installation.

2 **RIGID CONDUIT** made of the finest steel available • Clifton's exclusive process for hot-dipped galvanizing guarantees a uniform zinc protective coating ..inside and out • the finest rigid conduit made. Clifton Rigid Conduit is approved by Underwriter's Laboratories, Inc. and conforms with Federal Specification WW-C581C and ASA Specification C-80.1-1953. Clifton EMT is approved by Underwriter's Laboratories, Inc. and conforms with Federal Specification WW-T-806B and ASA Specification C-80.3-1953. RIGID CONDUIT ELBOWS, COUPLINGS, AND NIPPLES in a full range of sizes • are manufactured of the same fine high quality steel as RIGID CONDUIT • hot dipped galvanized inside and out.

3 **FLEXIBLE STEEL CONDUIT** really flexible and crush-resistant for easier and faster installations • manufactured under Clifton's rigid controls from purchase of high quality steel tape to finished product • smooth inside surface assures you trouble free pulling during installation. Clifton Flexible Steel Conduit is approved by Underwriter's Laboratories, Inc. and conforms with Federal Specification WWC-556. Other quality products by Clifton: Bushed Armored Cable; Unarmored Service Entrance Cable; (CLIFTX) Non-Metallic Sheathed Cable; CLIFTALL-UF; Building Wire —TW, RHW, RR.

CLIFTON CONDUIT CORPORATION
A Division of General Cable Corporation
3300 Eastbourne Ave., Baltimore 24, Md.



1 2 3

ALLIS-CHALMERS

"Originators of 5/8% Step Regulators"

Caliband is an Allis-Chalmers trademark.

Lower! Lighter! Perfect for joint-pole use

new JFR regulators cut installation costs

CALIBAND control slashes setting time without changing customer voltage or interrupting service! A twist of the knob and you set or test voltage level and band width No need to return compensator settings to zero.

Allis-Chalmers all-new JFR is the top qualifier for joint-pole use . . . pad or platform mounting. Tank size and weight reduced up to 33%, due to JFR's improved materials and design techniques. Naturally, you save on transportation, handling and installation.

More new JFR advantages! Now offered as *standard*, position indicator drag hands reset by pushbutton on the control panel. A new, quick-sight gauge instantly reveals oil level. Exclusive unidirectional breather removes all moisture and contaminating gases. And a new cover, with hidden bushing mounting studs, cuts maintenance. *For all the facts ask your nearby A-C office for new JFR Bulletin 21B7977E or write* **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1261

For phone number of closest representative see advertising index in back of book.

How much brighter would your customers like their secretaries?

20%? You can brighten their secretaries—and all their other people, too, by improving their "eye-Q" (their ability to see better, work better). If the present lamps are 1 to 3 years old, suggest replacing them with General Electric F-40 Fluorescent Lamps tonight. Tomorrow your customers will have 20-35% *more light without adding a single new fixture!* G-E F-40's work in present 40-watt fixtures whether they use starters or not, cost 5¢ less than previous rapid start lamps.

50%? It can happen. New G-E Premium 3 Lamps are the most powerful 40-watt fluorescents on the market and the first 40-watters to deliver over 3,000 lumens! Just replace all his 1-to-3 year old lamps with them. The higher lighting level means his people will make fewer errors; efficiency and morale will get a big boost. General Electric Premium 3 Lamps also work with or without starters. They get up to 50% more light without spending a cent on new fixtures.

GENERAL ELECTRIC...WHERE BRIGHT IDEAS BECOME BETTER LAMPS

USE GENERAL ELECTRIC "MONEY SAVER" FLUORESCENT LAMPS TO BRIGHTEN PRODUCTION PEOPLE AND SALES AREAS, TOO

New Premium 3 and F-40 Lamps are two recent examples of how G-E research saves your customers money and gives them more light, too. And at the same time gives you the newest, most effective sales tools to work with. General Electric Co., Large Lamp Dept. C-011, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ALLIS-CHALMERS

New Aluma-Clad switchgear combines long-range economy with

styling for the sixties

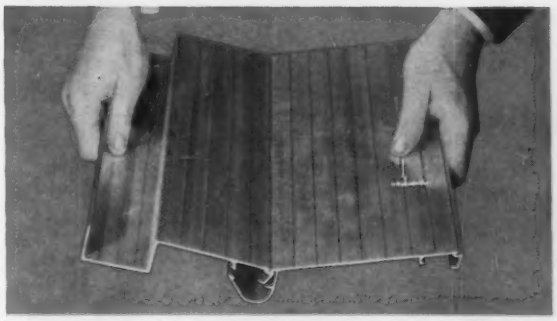
Lasting beauty, long-range economy. You get both with new *Aluma-Clad* switchgear enclosure.

Modern, functional design makes this an innovation welcome in any neighborhood. Ribbed, all-aluminum exterior is soft finished to prevent offensive glare. Color-anodized trim enhances its beauty.

Painting is completely unnecessary! *Aluma-Clad* switchgear can't rust. Its aluminum exterior resists corrosion from salt air and contaminated atmospheres.

Low installation costs! Lightweight aluminum sections dramatically reduce installation time, labor cost. Panels bolt together with aluminum alloy bolts and neoprene gasketing. Because of the unit's light weight and unusual rigidity, simple concrete piers can be used instead of heavy slabs.

Contact your nearby A-C office for complete details on *Aluma-Clad* switchgear, or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wis. A-1283



Interlocking modular panels snap together to form a permanent leak-proof joint. Extruded vertical joint sections, every six inches, act as reinforcement — provide exceptional rigidity.

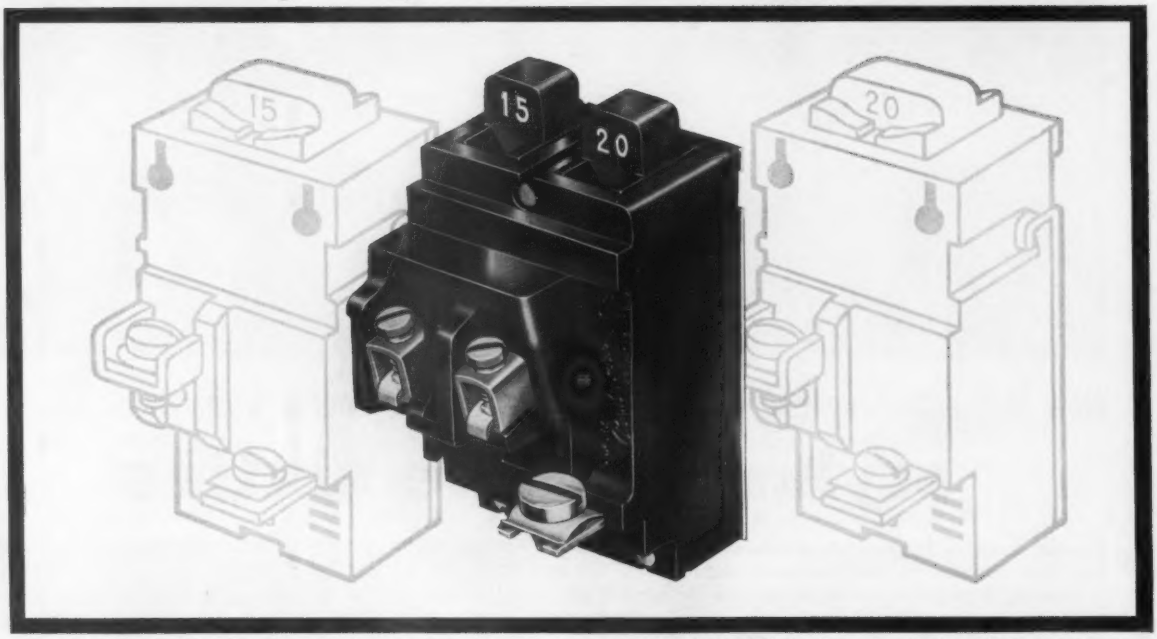
Aluma-Clad is an Allis-Chalmers trademark.

For phone number of closest representative see advertising index in back of book.

BullDog's

NEW DUPLEX

The only space-saving breaker



1. SPACESAVER. New Duplex Pushmatic® breaker puts two breakers in the space of one single breaker. You get more electrical circuit flexibility with smaller panels; and 15- and 20-amp capacity, in any combination.

2. DOUBLE PROTECTION. Duplex is the only 2-in-1 breaker that gives coil-magnetic short-circuit protection, as well as thermal overload protection, for each circuit. Provides identical, independent coil protection in each pole.

Consult the following Pacific Coast representatives:

Coast Electric & Manufacturing Co.
1733 N. E. Seventh Ave., P. O. Box 7866
Portland 12, Oregon

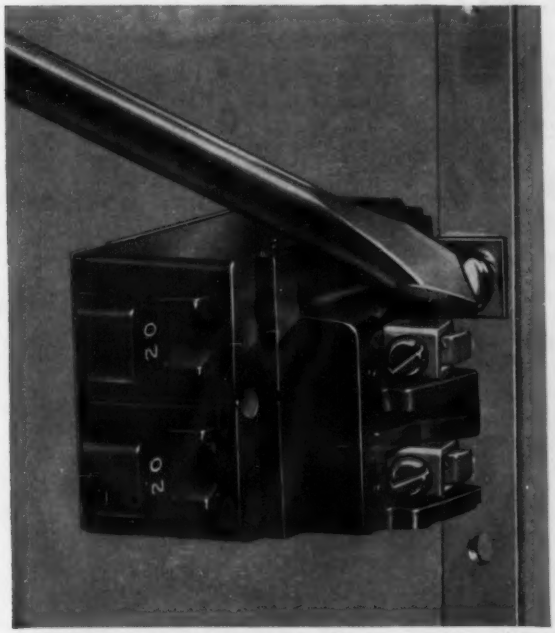
Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

Safety Switchboard Company
910-89th Avenue
Oakland 21, California

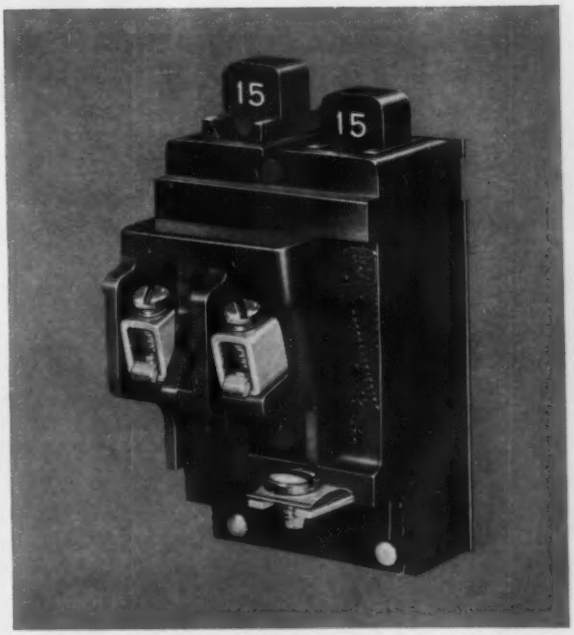
BullDog Elec. Prod. Co. of Los Angeles
3020 Supply Ave.
Los Angeles 22, California

PUSHMATIC!

with coil-magnetic protection!



3. ONE BOLTED CONNECTION. Duplex provides a single positive bolted connection to bus bar. Electrical contact is under constant pressure, won't work loose, won't overheat. Installation is quick and easy.



4. PUSHBUTTON CONVENIENCE. Only Duplex Pushmatic has pushbutton convenience. Pushbutton pops up, can be identified instantly by sight or touch. You reset it with a push of the finger. Simple, fast, foolproof!

BullDog Electric Products Division, I-T-E Circuit Breaker Company,
Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont.
Export Division: 13 East 40th St., New York 16, N. Y.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

Here's a low-cost guy you'll never have to replace...

Copperweld®

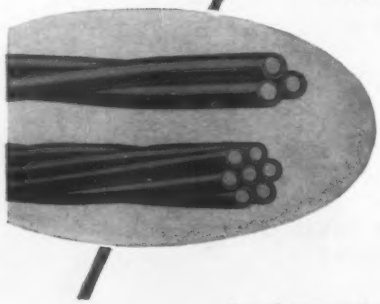
TYPE M™ STRAND

...gives you both strength and permanence

Here's an easy way to eliminate the trouble and expense caused by the failure of rust-weakened guys. Install Copperweld Type M Strand—it's your best buy for all guying purposes.

The rugged strength of Type M Strand is permanent because each wire is protected against corrosion by a thick cladding of pure copper molten-welded to the steel core. The copper cannot crack, flake or peel so there's no danger of corrosion even getting started.

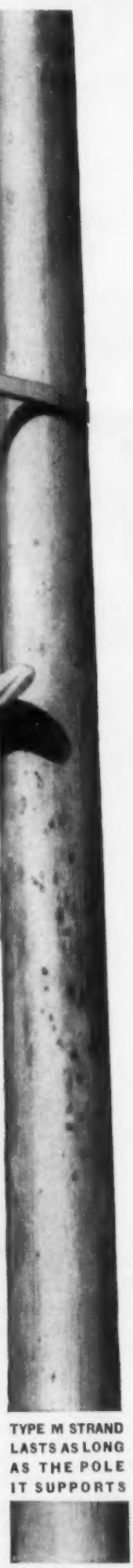
You can count on dependable, maintenance-free support from Type M Guy Strand. Easy to install, it can be dead-ended by any of the conventional methods. Write today for complete engineering data.



COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York



TYPE M STRAND LASTS AS LONG AS THE POLE IT SUPPORTS

For phone number of closest representative see advertising index in back of book.

COMPACT... ADAPTABLE... RELIABLE

New Westinghouse Isolated Phase Bus

Ever-increasing current and voltage ratings . . . maximum in compact arrangement . . . full adaptability to generating and distribution station layouts . . . complete reliability—these are the modern station demands met by new Westinghouse isolated phase bus. Here are the design features which assure long, trouble-free performance:

Single Insulator. Only one high-strength insulator is used at each bus support location. Deep grooves provide high dew withstand voltage. Resilient mounting reduces short circuit forces on the porcelain. All combine to provide maximum reliability of service.

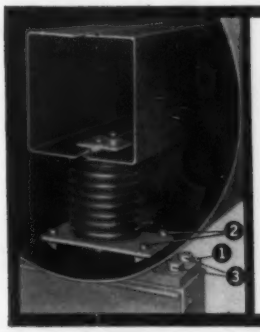
Main Conductor. Hollow square or tubular bus may be specified to suit application requirements.

Enclosure Construction. Enclosures are cylindrical; of heavy, heat-treated aluminum plate; rolled and seam-welded . . . assuring maximum strength against internal or external pressure and side stress. Enclosure tightness is assured.

Accessibility of Enclosures. Telescoping of enclosures simplifies inspection and maintenance of insulators and conductor joints. Adequate clearance facilitates telescoping and alignment. Longitudinal gaskets are eliminated. Circular, extruded, neoprene gaskets, retained by two-bolt clamping rings, make assembly easy and assure tight joints. Enclosure ends are not flanged. Small supporting feet reduce weight and provide smooth cylindrical exterior.

Coordinated Design. Westinghouse isolated phase bus is coordinated in design to assure long, economical service with minimum maintenance—and to reduce field assembly time by permitting large assembly shipments, limited only by shipping and handling facilities.

For complete facts, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60998

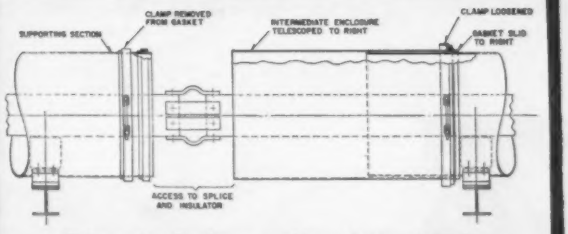


Only One Insulator Is Required at each main conductor and enclosure support location. Enclosure tightness is assured by these arrangements:

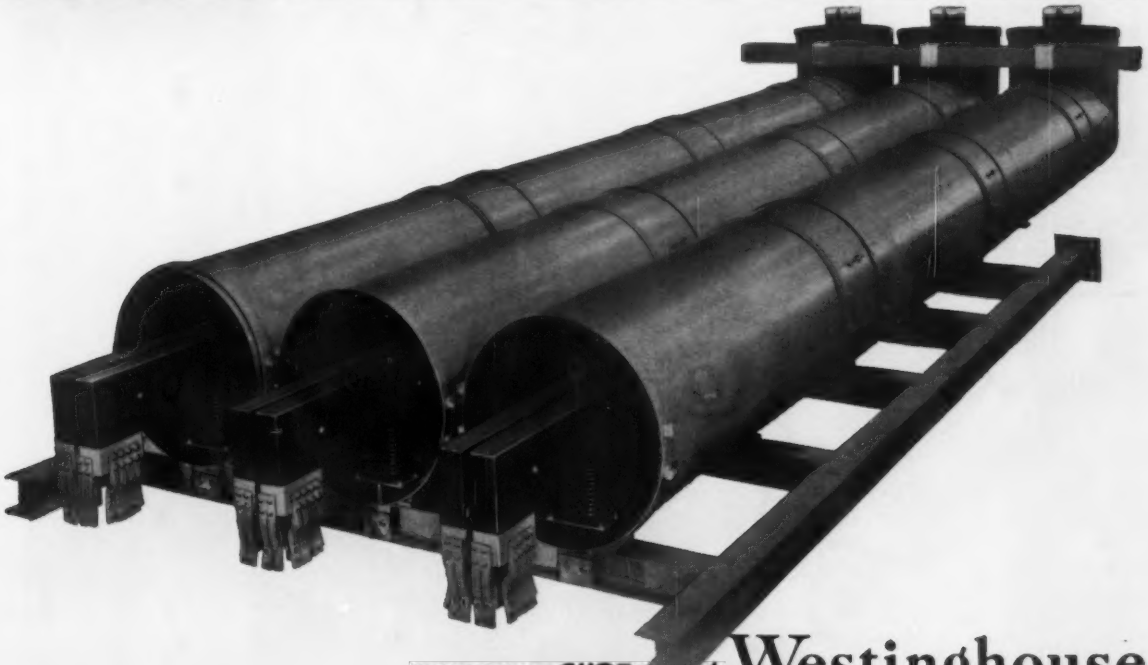
1 Welded-in support of high-strength extruded aluminum.

2 Resilient insulator mounting plate bolts dead-end in extruded support.

3 Assembly mounting bolts are external to the enclosure.



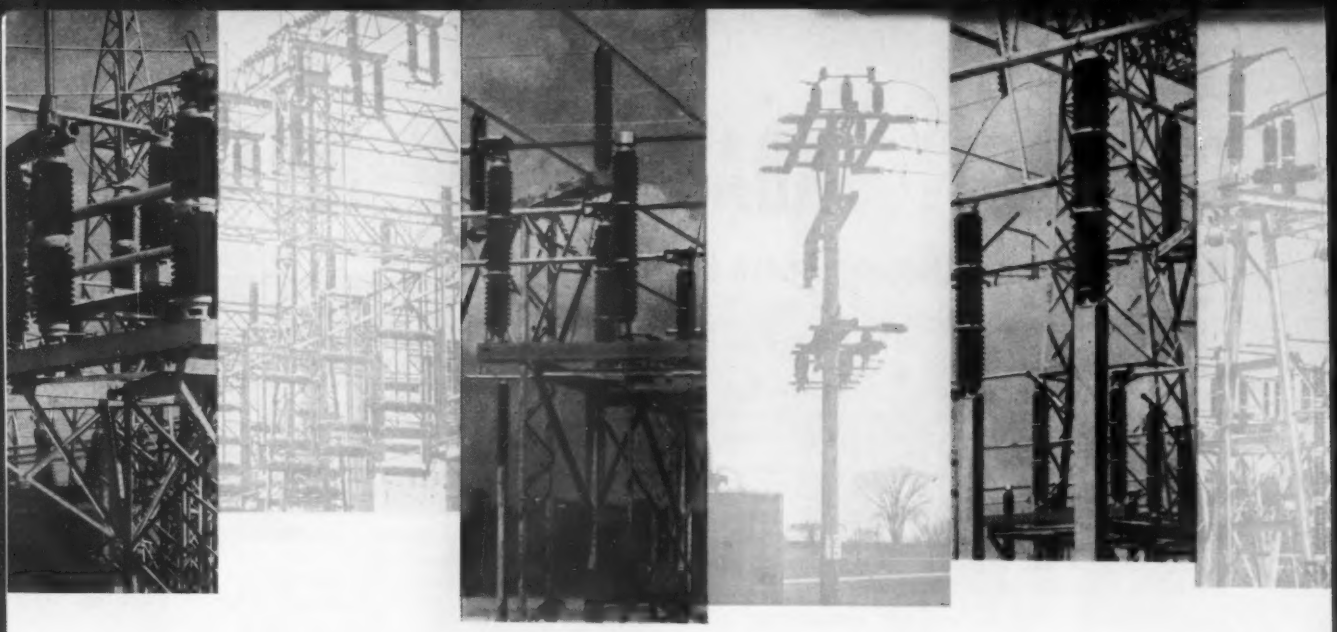
Telescoping Enclosure provides ready access to insulators and conductor joints for inspection or maintenance.



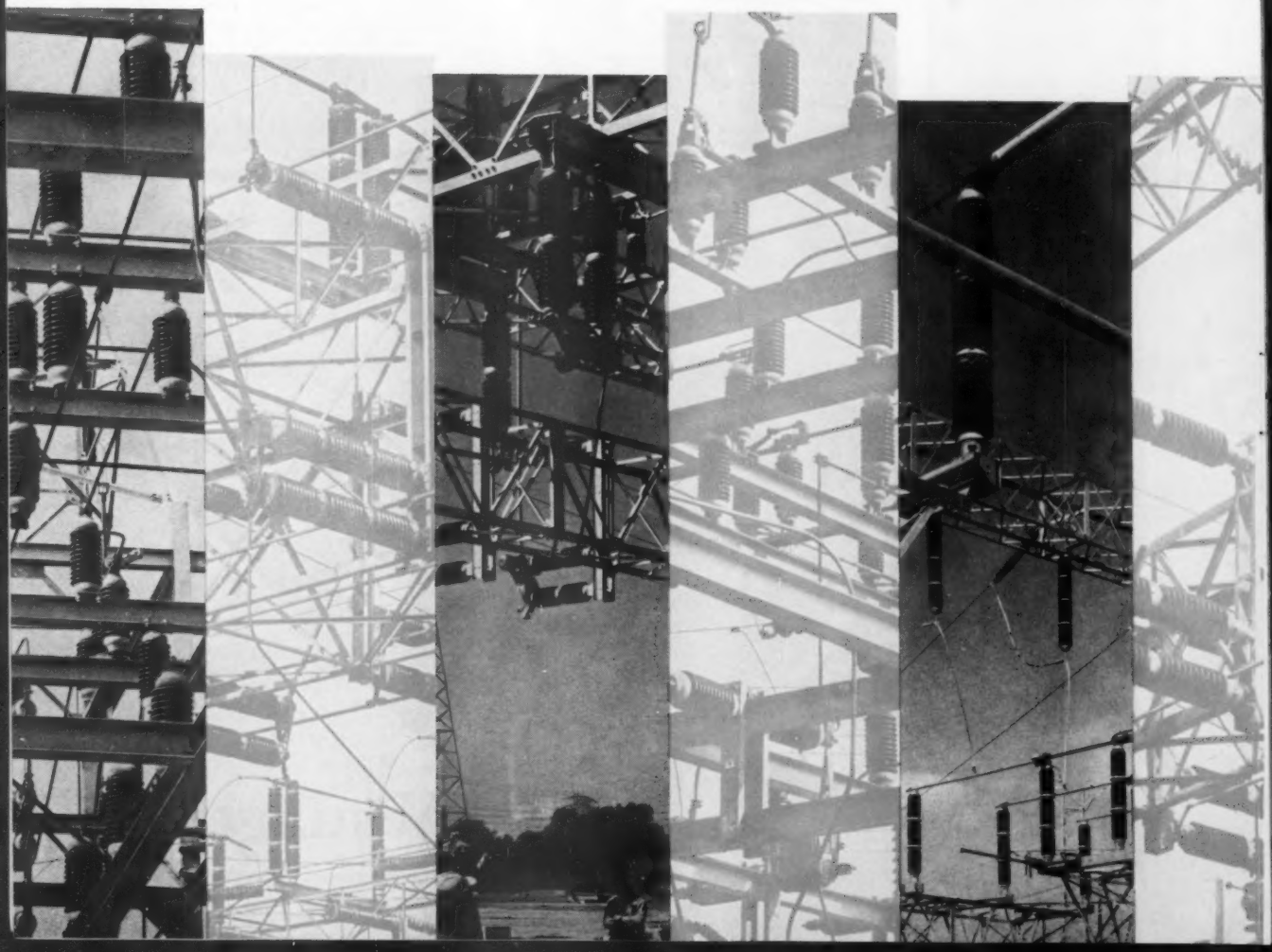
YOU CAN BE SURE... IF IT'S Westinghouse

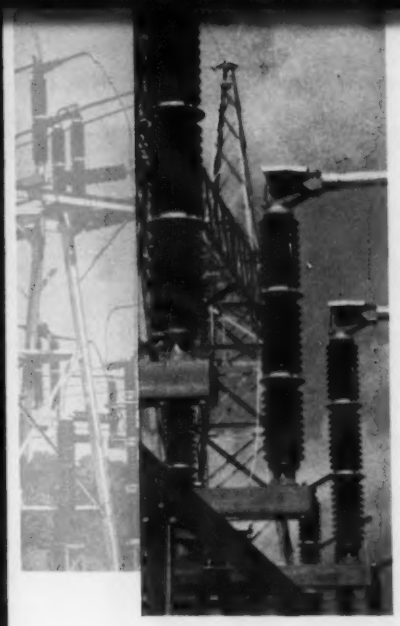
TUNE IN WESTINGHOUSE - CBS TV - RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10 - 29

For phone number of closest representative see advertising index in back of book.



When you design with Lapp Station Posts.....





Voltage Rating kv	BIL, kv	Cantilever Strengths, lbs.		
7.5	95	2,000	4,000	8,000
15	110	2,000	4,000	8,000
23	150	2,000	4,000	8,000
34.5	200	2,000	4,000	8,000
46	250	2,000	4,000	8,000
69	350	1,500	4,000	6,000
115	550	1,700	2,900	4,000
138	650	1,450	2,450	3,900
161	750	1,200	2,000	3,500
	900	910	1,450	2,750
	1050	750	1,170	2,300
	1300		1,000	2,000
	1470		900	1,750
	1640		770	1,550
	1800		680	1,400

.....you can have what you want in BIL, in strength, in stiffness

Use of Lapp Station Posts frees designers of modern substations from the need to design around characteristics —and shortcomings —of conventional switch and bus insulators.

The family of Lapp Station Posts is a "modular series" which gives widest range of insulation levels *and* strength ratings. Station Posts are smaller in diameter, too . . . lighter in weight . . . stiffer . . . easier to assemble; and they're suited to mounting horizontally, underhung or angled . . . available in strengths greater than have ever been offered in conventional pin-cap units.

Stations on Lapp Station Posts require less real estate, less steel work. And, because their performance is better under all electrical conditions and mechanical loading, they need less maintenance too. You should have the whole story. You can read it in the new Lapp Catalog No. 8. If you haven't a copy, we'll be glad to send one.

Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

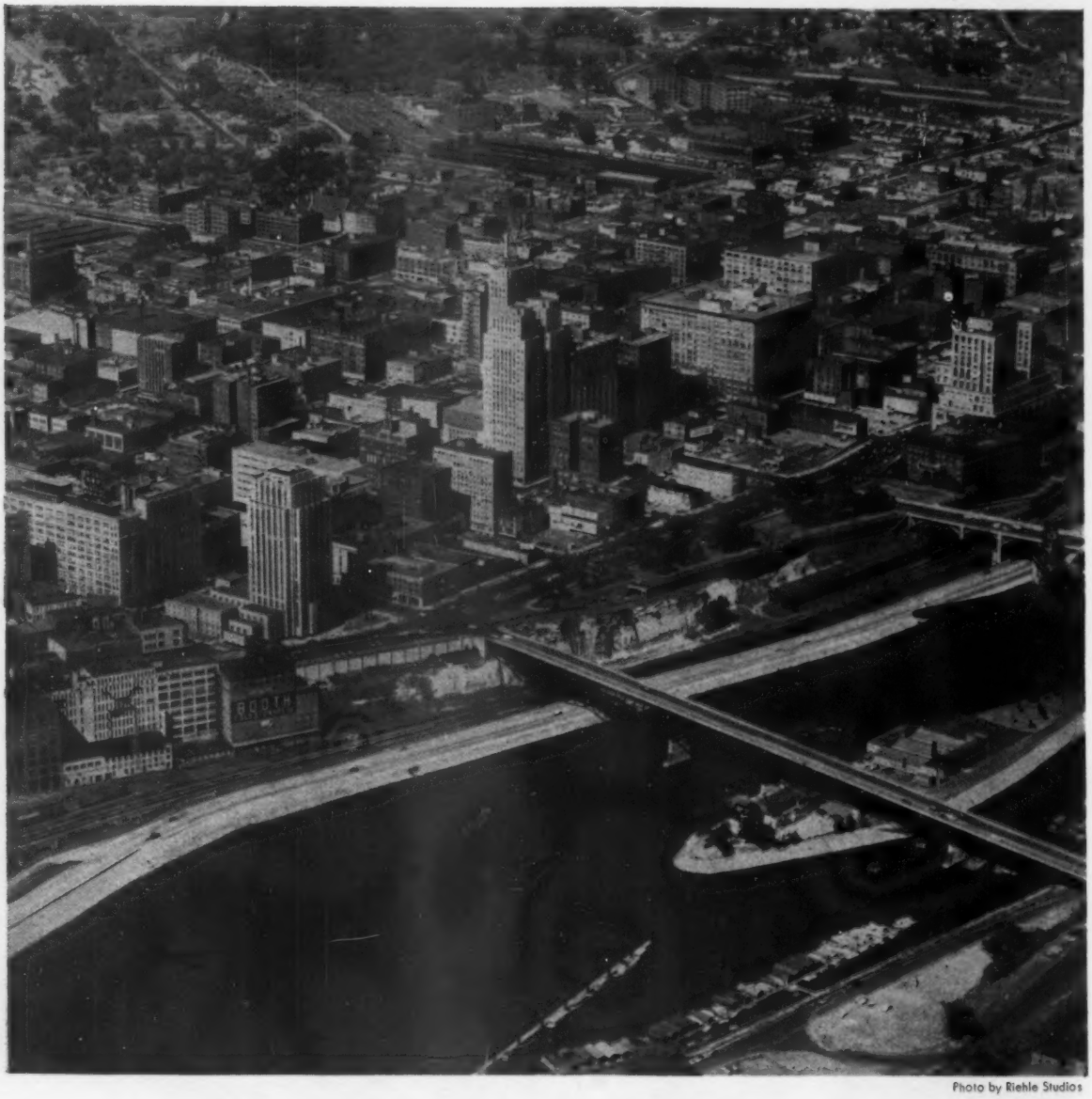


Photo by Riehle Studios

Minnesota's Capital City

St. Paul, capital city of Minnesota, is prominent, too, for its widely diversified industries. These include brewing, food processing, livestock marketing, manufacturing, oil refining and printing. The city's transportation needs are served by nine different railroads, totalling one quarter of the nation's rail mileage.

The combination of demands for electric power is expected to nearly quadruple power needs of the area within 20 years. This requirement, together with the future needs of railroads and all industry, is being anticipated by Kerite, with a standard of cable dependability established in 1854. ***As the need for quality cable continues to grow, Kerite will be ready to supply it.***

KERITE CABLE

DAYS KERITE — *it's the* **KERITE** *that makes the difference*

DESIGNED TO PROGRESS PIPE MEMBER

General Office—30 Church Street, New York 7, N. Y.

SALES OFFICES:
Albuquerque, Ardmore, Pa., Birmingham, Boston, Chicago, Cleveland, Denver, Glendale, Cal., Houston, Lake Wales, Fla., Portland, Ore., St. Louis, Salt Lake City, San Francisco, Seattle

COMING YOUR WAY

the Sangamo J3, the only meter with.....

TRUE MAGNETIC FLOTATION

THIS IS THE ONE, developed to meet your needs... THE SANGAMO SINGLEPHASE J3 WATTHOUR METER. This is the new and noteworthy development in watthour meters this year. One of the exceptional advances in metering in any year!

The moving system of the J3 is not supported or suspended. It floats, pure and simple, permanently and without friction, on a field created by magnets that are dimensionally and magnetically uniform. Stability is assured by the use of specially bonded Alnico in *all* magnetic components of the system.
And, the J3 has these other *new* features:

A VISIBLE, SELF-CLEANING GAP that cannot be bridged by metal particles.

A CONTROLLED FLOATING SYSTEM for best performance on high loads. Side thrust is substantially reduced; tilt error is insignificant. These features combined with the unique slow speed of Sangamo J Meters, give you a moving system that is *guaranteed for life.*

ADVANCED INSULATION LEVEL for better protection and easier heat dissipation.

SMALLEST SIZE for easiest handling.

PLUS THESE TRADITIONAL SANGAMO ADVANTAGES: highest torque; slowest speed; lowest watt loss; sectionalized construction; corrosion-resistant finishes and materials; glaskyd base.

Your Sangamo Representative is coming your way with a sample of the J3. Become familiar with its "pluses". Then, plan to put it to work... for it has everything you want in a watthour meter. And that's a promise, for this is one of the really great ones.

JM60-4

SANGAMO ELECTRIC COMPANY / SPRINGFIELD, ILL.

For phone number of closest representative see advertising index in back of book.

FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
- Complete service

NOW 12% higher

SYMBOL OF FULL VALUE

With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

continuous loadability

General Electric's new Permalex* insulation system increases medium transformer continuous kva capability, or gives five times longer transformer life

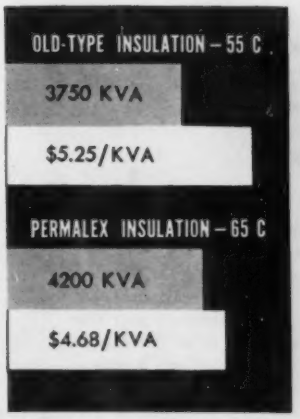
Now, as standard on all medium transformers**, and at *no extra price*, General Electric uses Permalex insulation . . . a system permitting transformers designed for 55 C rise to operate at 65 C rise with 12% more continuous capacity!

For example, a 3750-kva, 55 C transformer with Permalex will operate at **4200 kva**, 65 C rise with normal life expectancy. Or, if you prefer to operate the unit at 55 C, you can expect five times the life of present insulating systems! Fan-cooled rating increments remain the same and can be applied at the 65 C operating condition. Also, Permalex is *completely compatible* with everything in the transformer.

The Permalex system used in General Electric medium transformers features Formex† wire and cyanoethylated paper insulation. Formex insulated wire offers exceptional dielectric strength, outstanding thermal stability and high resistance to moisture effects. Cyanoethylation, which replaces many moisture producing molecules with non-moisture producing molecules, raises the thermal endurance of paper and retards the formation of water.

Ask your G-E Apparatus Sales Engineer to point out the many ways you save with Permalex insulated transformers . . . another result of General Electric's *continuing* Certified Full-value Transformer Program. General Electric Company, Schenectady 5, New York. 416-29

* Trade-mark of General Electric Company.
** 501 to 7500 kva, 69 kv and below.
† Reg. Trade-mark of General Electric Company.



PERMALEX INSULATION gives you extra kva at no additional transformer cost. The result is more economically uprated substations because of the lower cost per kva with no increase in transformer size.

55 C Self-Cooled	65 C Self-Cooled	65 C Fan-Cooled
750 kva	840 kva	966 kva
1000	1120	1288
1500	1680	1932
2000	2240	2576
2500	2800	3500
3750	4200	5250
5000	5600	7000
7500	8400	10500

DEFERRED CHANGEOUT of added kva gives more years of operation without extra investment. Real evaluation of Permalex is measured by present worth of capitalized value of deferred investment.

FORMEX TURN INSULATION with cyanoethylated paper insulation provides high dielectric strength, outstanding resistance to moisture and much longer life for medium transformers.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

news

It's easy to get a catch like this at Washington Water Power's Noxon Rapids Dam reservoir on the Clark Fork River in western Montana. Displaying the results of a brief fishing trip there are: A. H. Chaney, Montana Fish and Game Department; R. Harold Anderson, Washington Water Power Co., and Charles Duffield, Montana Power Co. Sportsmen have called the reservoir area the state's best fishing spot; report limit catches of trout that range from 10 to 16 in. in a few hours. A WWP restocking program included planting of more than 2,000,000 fingerling Rainbow trout

Idaho Power Co.'s Oxbow Dam power house (below) is beginning to rise from the bedrock excavation at the base of sheer cliff. When complete, the 200,000-kw plant will house four units initially

First bucket of concrete was poured in June at John Day Dam. The project, under construction on the Columbia by the Walla Walla District Corps of Engineers, will produce 1,304,000 kw initially

Humberto Estrada, first prize winner at the 12th annual motor winding contest sponsored by San Diego Electric Club, shows his motor to H. G. Dillin, executive vice-president, San Diego Gas & Electric Co., and Margaret Hill, only girl among 47 competing high school students

EW

Intertie Recommended

A huge, twin 500-kv transmission intertie between Bonneville Power Administration and California has been recommended by H. Zinder & Associates in a special study for California Gov. Edmund Brown. The report was promptly turned over to the Senate Interior Committee at a hearing in Washington, D. C.

The Senate group, which has been considering an alternate, 230-kv single-circuit intertie between Bonneville and Pacific Gas and Electric, agreed that the new Zinder study deserves consideration—and postponed any action on the Bonneville-PG and E line until 1961.

PG and E had proposed its 97-mile line, including a section to be built by California Oregon Power Co., to take dump BPA power for peaking use. Its proposed line would cost about $4 million, would be paid off in five years. PG and E has testified that a large federal line, connecting Bonneville and the Central Valley Project, would be impractical because both systems have surplus dump power and their peak demands and hydro runoffs do not mesh satisfactorily.

Zinder, however, has proposed two 500-kv circuits between Bakersfield, Calif., and Bonneville—one to John Day Dam, the other to The Dalles. Cost of the project would be at least $200 million and would be paid off over a 10-year period. Zinder estimates that, with the addition of transmission line revenues, the annual federal payment would be $12 million, yearly private payments would be $28 million. Zinder does not comment on whether the lines should be built by federal, public or private systems—comments only that it should be a common carrier.

In order to make the huge lines pay off, Zinder made two recommendations:

1. A 300,000-kw steam plant would be built near existing coal fields in Washington and the firm power moved over the intertie to California customers. This steam plant, in fact, would produce the needed firm power revenues to finance the large line. And Zinder also points out that it would help boost Washington's sagging coal economy.

2. Intertie power would be sold into southern California, permitting the backing off of Lower Colorado hydro plants, as well as conservation of natural gas and fuel oil.

The proposed line would have a 2-million-kw peaking capacity, 1.6-million-kw firm power capacity.

The Senate group not only postponed any action on the proposed BPA-PG and E line to consider the Zinder study, proposed by Governor Brown. It also said it wants to look into the legal problems of selling Bonneville power outside its present marketing area. Oregon Public Utilities Commissioner Jonel Hill raised the issue. Sen. Henry Jackson (D-Wash.) said he thinks clarifying legislation should be considered and passed before either the PG and E or the proposed 500-kv lines are built.

Either way, no intertie will be started until well into 1961, at the earliest.

PUD Charged with Failure to Call for Bids

Franklin County PUD of Pasco, Wash., has been criticized by examiners for the state auditors department for failing to call for competitive bids on the purchase of $77,827 worth of transformers.

An audit of PUD affairs for 1959 showed that the district placed 70 orders for approximately 270 transformers, and in each case the order was under $5,000. State law requires bids on purchases in excess of $5,000. "It is submitted," the examiners said, "that the placing of 70 orders during the year has the effect of circumventing the requirement to call for bids.

"It is noteworthy that in 7 of 12 months covered in this examination transformer purchases exceeded the $5,000 limit established by the state law."

NEWS INDEX

Association Affairs	61
Communications	58
Growth	58
Manufacturers-Distributors	92
Market Development	60
Meetings Calendar	9
Nuclear News	59
People	85

Ackerman Reports To Senate Committee

"Federal leadership toward efficient development and use is vital, if the national water requirements are to be met between 1960 and 2000," reported Dr. Edward B. Ackerman in a special study for the Senate Select Water Resources Committee. The committee, headed by Sen. Robert S. Kerr (D-Okla.) is to complete its report this year on national water problems, and is expected to submit its report to Congress next January.

The Ackerman study was made at the request of the committee. It points out, among other things, that the dominance of urban and industrial water supply will become more pronounced in the next few years over other water uses, that: (1) integrated basin-wide water regulation will be a necessity; and (2) dam, reservoir and other water sites should be protected now from less essential purposes.

Ackerman called for a strong federal "strategy" to expand technical data and water resource information. He added that there is a "substantial opportunity for further consumer benefit" through economies in large-scale water projects, particularly in electric power.

On Again Off Again

The $50 million Oroville-Wyandotte construction bid has run into legal problems. On the basis of dollars, the Kaiser combine was apparently low bidder except for the fact that Kaiser, in its bid, included two provisions, one relating to extending the completion date if the job were not awarded in 45 days and the other limiting liability for liquidated damages to $1.4 million.

The initial report from Kaiser was that it had the job, but behind the scenes lawyers were studying the

instructions to bidders which said, "the insertion of any other proviso or condition may be cause for rejection of the bid."

After some days of consideration, it was decided that the Kaiser bid would be rejected based on the proviso and the award made to Guy F. Atkinson Co. Atkinson argued that, if it had been able to limit its liability and include the same condition on completion date, it would have been able to reduce its bid several millions of dollars.

OWID officials are hopeful that they will not have to go out for a second bid which might lose them a construction season and may even result in higher bids, placing the job outside the financial capabilities. Time will tell.

Recreational Benefits Tacked on to Bill

Legislation to include recreational benefits in determining feasibility of federal multipurpose projects was tacked on to the federal Rivers and Harbors Flood Control Bill (HR-7634) by the Senate Public Works Committee. The special section is expected to be approved by the Senate, House of Representatives, and probably signed by President Eisenhower.

Basically it would improve the chances for marginal federal projects by allowing up to 10% of the cost to be allocated to recreation—on the basis of 50¢ per day per visitor to the project. These figures could be changed by future administrations, if necessary.

Policy Statement Sharpens Dispute

The clash between Tacoma City Light and Puget Sound Power & Light Co. over service to the growing Federal Way district between Tacoma and Seattle has sharpened as a result of the issuance of a policy statement by the Tacoma Public Utility Board.

Tacoma City Light will extend its service beyond the city's borders if the people living there so desire, declared Harry B. Berry, chairman of the board.

The dispute began several years ago when a number of the Federal Way businessmen supplied by Puget Power requested service from the Tacoma utility. The utility took no immediate action but, after the state legislature last year voted down a bill which would have halted expansion by municipal utilities, persuaded the Tacoma City Council to pass an ordinance authorizing negotiation or condemnation of Puget Power properties in the area.

In the meantime, businessmen have received rate concessions from Puget Power and have lost much of their enthusiasm for making a change. Puget Power claims that 75% of the people living in the Federal Way district have petitioned the company to oppose City Light's expansion plans.

Break Halts Power Production

A break in a timber dam structure halted power production from Washington Water Power Co.'s 1,200-kw Meyers Falls plant on the Colville River in northeastern Washington. The present dam was constructed in 1915, replacing an earlier structure built in the 1890s. Planning work, under way to replace the structure before the break, will now be stepped up. WWP took over the plant in 1929 when it acquired Stevens County Power & Light. An earlier dam, just downstream, had been constructed by Northwest Light & Power Co. The original plant was 125 kw

Lower Interest Rates Proposed

Legislation to lower the interest rate for future dams in the Upper Colorado Storage Project was passed last week by the House of Representatives. The measure was a rider to the noncontroversial Norman Project, Okla., authorization bill (S-1892) which was simultaneously approved by the House. Previously, the Norman project had been approved by the Senate.

Biggest beneficiary, so far, of the measure would be the Curecanti Project, Colo., whose interest rate would be cut from 4.125% under the old rate (enacted in 1956) to 2.625% under the new formula.

The new formula calls for the rate of interest to be based on the average of all outstanding long-term federal borrowings that mature in 15 years or longer. The old formula was based on the cost of long-term federal borrowings during June following start of work on each specific project.

► **Wages of 1,000 Seattle electricians** will be increased 15¢ an hour, effective July 1, under a new contract negotiated by the Puget Sound Chapter of the National Electrical Contractors' Assn., with Local 46 of the Electrical Workers Union. The new scale will be $3.95. Vacation pay will go up from 15¢ to 16¢ an hour. Hiring procedures are modified to permit employers to call back former employees, a condition which management has been seeking since adoption of an exclusive hiring-hall plan.

► **The Wyoming Natural Resources Board** has passed a resolution urging that Wyoming receive 14% of the power from the Upper Colorado River Basin projects—the same percentage of unappropriated water allowed the state under the Colorado River pact.

► **Tacoma City Light** has inaugurated an experimental budget payment plan for residential customers using large amounts of electricity. The plan will aid customers who use electric heating and have to pay large winter bills. To qualify for the plan, the customers must use 2,000 kwh per month.

► **Lincoln Service** Corp., Frontier, Wyo., has asked the Wyoming PSC for authority to serve five additional townships in Lincoln County. The townships include the coal mining camp of Elkol, site of Utah Power & Light's new steam generating station, and Food Machinery & Chemical Corp.'s industrial coking plant.

Court Rules on Relocation Costs

The Utah State Supreme Court has ruled that the state must pay for relocating utilities when such changes are forced by highway construction. The decision reaffirmed as constitutional an act passed by the 1957 Utah legislature and rejects a ruling of the state's attorney general two years ago that the law was unconstitutional.

C. Taylor Burton, director of the Utah highway department, said the action of the court would "cost the state millions of dollars in the future." Immediate cost of the decision will be about half a million dollars, on the basis of contracted work.

Supreme Court Justice F. Henri Henroid declared in his brief that now that the burden of cost had been shifted the people should benefit in rate cuts. The highway department is considering: (1) requiring utilities to agree beforehand to the cost of relocation; (2) make them pay rent for right-of-way along public highways; and (3) alternatively, if these proposals are rejected, prevent utilities from using the public right-of-way.

Linemen Run into Indian Roadblocks

Linemen, attempting to plant power poles on a strip of California land alongside the Colorado River opposite Yuma, Ariz., are running into hostile Indians. The Indians, manning roadblocks with rifles, have set fire to piles of power poles.

The land involved is a 7,000-acre chunk known as "The Island" which for years has been claimed neither by California nor Arizona because it has been created by the meandering Colorado River, which forms the boundary between the two states.

Squatters have established farms on the land and requested electrical service from the Imperial Irrigation District. When crews attempted to set up lines, deputies of the Fort Yuma Indian Reservation in Arizona threatened to use violence to halt work.

The Indians claim The Island by an executive order of President Chester A. Arthur, issued in 1855, which gave them 45,000 acres. At present, the reservation has been whittled to 8,000 acres.

► **The California State Supreme Court** has granted a stay on the state PUC order to halt construction of Richfield Oil Corp.'s natural gas pipeline to Southern California Edison Co.'s Mandalay steam station. Arguments will be presented to the court on June 13. The commission has ordered work stopped on the line between Rincon Point and Casitas Springs after Southern Counties Gas Co. protested that Richfield was speeding up construction before the court's final ruling on whether Richfield's sale of natural gas to Edison would, in effect, make the oil company a public utility and subject to PUC jurisdiction.

Rate Reduced

Rate reductions have been announced by three PUDs in the State of Washington. Largest reduction was put into effect June 25 by Clallam County PUD of Port Angeles, which lowers rates in the western part of the county 34%.

Lewis County PUD reduced its commercial rate to bring an initial saving of $80,000 to 1,100 customers. The Okanogan County PUD removed the demand charge from residential rates and placed a block of 400 kwh at 6 mills in the rate for residential customers using electricity for water heating. Elimination of the demand charge results in a straight 1¢ rate for residential space heating.

At the same time the Chugach Electric Assn. board voted to reduce electric rates by approximately 30% in six of the greater Anchorage communities, effective Sept. 1. Rates were lowered by reclassification from rural to urban.

► **Portland General Electric** Co.'s 160-man construction and maintenance department has racked up one million man-hours of accident-free work time in a 2½-year stretch. The department has qualified for its third consecutive National Safety Council award of merit, a record achieved by no other PGE department. Commenting on the performance, Tom Delzell, PGE board chairman and chief executive, said, "the value of such an example can perhaps be measured best in terms of what might have been. The pain and expense that could have come with accidents which didn't happen can only be imagined."

► **Central Lincoln Public Utility District** has requested the annexation of two incorporated cities, Toledo and Reedsport, and other territory in four counties to its legal service boundary. The annexation totals 310 square miles, with a population of 8,000.

Integration Proposed for Peace and Columbia Projects

The Peace River Power Development Co. has proposed integration of Peace and Columbia River developments in an engineering report prepared by Ralph Chantrill and Jack D. Stevens.

The report proposes that the Peace-Columbia scheme be a part of a huge international power pool, which will include British Columbia, Washington, Idaho and Oregon, and ultimately Alberta, Montana, Utah, California and the remote northwestern part of B. C.

"All power studies show conclusively that the Peace River projects and other projects of a Pacific international power pool will complement each other so as to conserve resources, increase load carrying capabilities and strengthen the firm energy structure of British Columbia and the Pacific Northwest states," the report declares.

The report has been sent to provincial government officials and federal experts in Ottawa. The federal hydro authority said there would be no benefit in the Peace-Columbia scheme, since it would simply increase the price of Columbia power.

► **California Electric Power Co.** and **IBEW** Local 543 have agreed on a 4½% wage increase and reductions in employee contributions to the pension plan. The wage increase and pension benefit will extend to all company employees.

► **Public Service Co. of Colorado** has been authorized a $3.2 million electric rate increase. The PUC placed the company's rate base at $251 million and authorized a 6.15% fair return. Company officials had argued that the rate base should be $264.6 million and the return 6.75%. In reviewing the increase, which included both electric and gas, the PUC Chairman Joseph F. Nigro concluded that with more than half of the increase going to taxes "the U.S. government is the big winner here."

► **B. C. Power Commission** Chairman Hugh Keenleyside has confirmed reductions in the power commission staff totaling 15% during the past six months. The reductions are part of a widespread reorganization aimed at cost reduction. With the Upper Columbia River development imminent, it was indicated that the permanent staff will be increased but slightly and that most of the work would be done by outside consultants and temporary staff.

Communications

► **FRIGISTORS** will make their debut on the market before long. The highly descriptive name applies to a postage stamp size device that can be used to pump heat away from transistors and other similar devices by utilizing the cold junctions of a number of thermocouples. This is not a new principle; however, unusually high efficiencies have been attained by the use of alloys developed for the purpose and it is claimed that the heat equivalent of 10 or 15 w can be pumped from the cold to the hot junction. Net result will be to make it possible for transistors and similar heat sensitive devices to operate in ambient temperatures that could be damaging even without the heat generated in the equipment.

► **MICROWAVE DOCKET 11866** has been reopened by the FCC to permit filing of comments on the use of these frequencies for space communications. Deadline for written comments was July 8 and oral testimony July 18. However, the commission also indicated that a more extensive investigation on space communications was under way with a report or order due in March of 1961. Of particular interest was the fact that the commission stated it would accept testimony from AT&T and General Telephone only on this phase of the docket, thus perhaps indicating that an order may be forthcoming on the docket without permitting more testimony regarding adverse economic effects which the telephone companies claim will result from broadened use of microwave.

► **RAYTHEON** is now producing microwave equipment in the 12,000-mc band. Electric utilities will find this a virgin field with advantages and new problems. High gain antennas will be smaller and the resulting beams will be narrower. This will make it possible to crowd more systems into urban areas and use smaller reflectors. On the debit side is the fact that big rain drops cause severe attenuation, thus making the system of questionable use for long shots.

► **DAGE DATA VISION** slow scan TV system, which is used by Idaho Power Co. to read interchange meters over five-hop microwave system, has completed first year of operation. Both system load dispatchers and maintenance personnel are well pleased with the results. Contrary to common practice, the equipment is turned on for only a few minutes each hour. So far there is no appreciable degradation of the expensive Vidicon tube, which is believed to have a useful life under one year when in continuous service.

►**UHF TV BOOSTERS** will be legal after July 5, 1960, says the FCC in a recent rule addition. However, they can only be licensed to the parent station in order to fill in dead spots in the primary coverage area—not to extend the range of the station. This still leaves the presumably illegal VHF boosters out on a limb without any clear indication of their eventual fate.

► **LOW BAND SKIP** may have reached its peak during the summer of 1959 and can be expected to decline for the next several years. Dispatchers will be relieved to find that local mobiles will again be coming in louder than stations on the East Coast. In spite of the adverse effects of the sun spots, they have provided a supply of amusing skip stories, which should last until the next batch rolls around.

Growth

Contract Signed for Second Unit at Cool Water

A contract leading to the design and construction of a second steam-electric generating unit at California Electric Co.'s Cool Water plant near Barstow has been signed with the Fluor Corp., according to Fred Oldendorf, Calectric vice-president. The $14 million project will include erection of a 60,000-kw plant at the Mojave Desert plant site.

The $24 million project (two units) will mean a 120,000-kw generating station capable of meeting the increasing power requirements of the fast growing inland desert region.

► Construction of the **Kings River power house building** will begin July 1, under a contract awarded this week by PG and E to Rothschild, Raffin & Weirick, San Francisco. Project completion is scheduled for 1962.

► The Green Construction Co. and Tecon Corp., Seattle, Wash., were awarded a $1,191,000 contract for final excavation and construction of the **power house for the Corps of Engineers' $46 million Hills Creek Dam** on the Middle Fork of the Willamette River.

► **Authority to provide electrical power in the future Seedskadee reclamation project** was divided three ways by the Wyoming PSC. Southern Wyoming Utilities Co. got the biggest share of the area. Bridger Valley Electric Assn., an REA from Mountain View, was given authority to service only 1¼ sections surrounding Little America which Southern Wyoming willingly relinquished. Lincoln Service Co. of Frontier was awarded an area west of the Sweetwater-Lincoln county line.

► Officials of the five-county Bay Area Rapid Transit District, who had **hoped to wrap up a billion-dollar transit program** in a November bond election, have admitted this week that their plans won't be ready for the voters this year. Instead, San Francisco Bay Area commuters will have to wait at least until 1963 for a satisfactory program to be engineered, approved, financed and put under contract. Bay Area Rapid Transit Chief Engineer Kenneth Hoover said, "we will keep the heat on the project" in the face of what the mayor of San Francisco and other Bay Area officials consider a major setback for rapid transit.

► **Harold Quinton,** chairman of the board, Southern California Edison Co., stated that by 1980 he expected his company would produce more electricity than the combined present-day outputs of all the utilities in California, Nevada and Arizona.

► Under an agreement recently signed by **Douglas County PUD** and **Puget Sound Power & Light,** Puget will advance the PUD money to finance engineering prior to starting construction on the 424,000-kw Wells project. Total money required before the start of work will be more than $2 million. The contract provides that Bechtel Corp. be retained as engineer for the project. It also bars the PUD from joining the group seeking to develop Ben Frank-

lin Dam downstream and allows the PUD eight months to dispose of the power not already pledged to Puget Power.

► **Washington Water Power** Co. has invited the governors of four Northwest states to attend the dedication of Noxon Rapids, Montana's largest hydroelectric project. Montana's Gov. J. Hugo Aronson has been invited as the main speaker at the dedication.

► **Pacific Gas and Electric** Co. has announced plans to rebuild and enlarge the De Sabla power house on Butte Creek. Modernization program will cost $3.5 million and will increase the electrical capacity to 18,500 kw from the present 13,000.

REA Loans Authorized

Alaska: Kenai Lake Electric Cooperative, Moose Pass, $420,000 to provide additional electric distribution facilities.

California: Anza Electric Cooperative, Anza, $50,000 to assist consumers finance wiring of premises.

New Mexico: Central Valley Electric Cooperative, Artesia, $2,128,000 for transmission, distribution and substation additions.

Montana: Beartooth Electric Cooperative, Red Lodge, $400,000 to finance 42 miles of distribution line and system improvements.

California: The Plumas-Sierra Rural Electric Cooperative has received $722,000 for 37 miles of 69-kv transmission lines, four stubstations and 37 miles of distribution lines.

Colorado: Sangre De Cristo Electric Assn., $301,000 to finance the construction of 20 miles of distribution lines and the construction of a 3,000-kva substation.

New Mexico: Otero County Electric Cooperative, $50,000 to finance borrowers wiring of their premises.

Washington: Columbia Rural Electric Assn., $305,000 to finance the construction of 32 miles of distribution lines and 13 miles of tie lines.

FPC Permits

The FPC has issued a preliminary permit to the Chugach Electric Assn. of Anchorage, Alaska, for an 18,000-kw hydroelectric project on Alaska's Kenai Peninsula.

At the same time, the commission amended a preliminary permit issued last year to the Lewis-Clark G & L Cooperative including three additional dams and power houses in a development on the Yaak River in Lincoln County, Mont.

Nuclear News

Oak Ridge Gas-Cooled Reactor

The Tennessee Valley Authority has been selected by the Atomic Energy Commission to operate its 25-electrical-megawatt experimental gas cooled reactor (EGCR) plant now under construction at Oak Ridge.

None of the power from this plant will go to the TVA system, since the commission will use the entire output in its own operations.

Under the terms of an agreement now being negotiated, TVA will provide some design and construction assistance, train personnel and operate the plant until June 1968.

This $30 million plant will be fueled with slightly enriched uranium dioxide, moderated with graphite, cooled with helium and will make use of an existing turbogenerator that has been in use at the commission's steam plant for about 15 years.

Peach Bottom Gas-Cooled Reactor

The private industry counterpart to the EGCR, the high temperature gas cooled reactor for the Philadelphia Electric Co., reached an important step in its research development. General Electric Co. has been selected by the General Atomic Division of General Dynamics Corp. to design, build and operate a special nuclear fuel test loop as a part of this development.

This facility will be used for extensive irradiation testing of the prototype fuel for the 40-emw reactor that General Atomic is designing for the Philadelphia Electric Co. and the High Temperature Reactor Development Associates Inc.

This loop, which will be installed in the General Electric Test Reactor, will be helium cooled and will operate at coolant temperatures up to 1,400 F.

Unique Shipping Problems

Last month two unusual jobs of transporting equipment used in the nuclear field took place. The first was the moving of the reactor for the Hallam, Neb., sodium graphite nuclear plant of the Consumers Public Power District from its point of manufacture to the plant location.

This reactor, born at the shops of the Baldwin-Lima-Hamilton Corp., Eddystone, Pa., on the "wrong" side of the tracks, was too large to pass under these tracks through a 9½-ft-high tunnel that permits normal traffic to reach the other side. The use of three or four heavy-duty helicopters was considered for lifting this equipment over the tracks; but were deemed inadequate for the job. Instead, two miles of road were built and eight 50-ft-high poles to support lifting cables that raised and held 30,000-v transmission lines out of the way were used.

At 1 a.m., May 1, the reactor was moved safely across the eight lanes of the Pennsylvania Railroad's main line and on to a 150-ton barge where it started on its 45-day trip by inland waterways and an 80-mile trailer haul to Hallam.

The second unique move, also from the Philadelphia area, was the task of transporting the world's most powerful computer, the Univac Larc system, to the AEC's Lawrence Radiation Laboratory at Livermore, Calif. This $5 million system, built by Remington Rand, will be used to provide solutions to problems in nuclear physics.

This shipment, consisting of five van loads of intricate electronic computer equipment, was hauled in specially designed trailers with special landing gear-type suspension on each wheel to reduce shock and vibration. The equipment, packed in neoprene, polyethylene and air foam, was checked every five hours during the trip to insure that no damage would occur.

Atomic or Nuclear?

Two words, nuclear and atomic, are used interchangeably in referring to the processes for obtaining energy from the nucleus of the atom.

Since the entire nuclear energy industry is based on these processes, which involve only the nucleus of the atom, why shouldn't the word nuclear be used instead of the word atomic?

Nuclear reactors—instead of atomic reactors.

Nuclear plants—instead of atomic plants.

Nuclear energy—instead of atomic energy.

Nuclear weapons—instead of atomic weapons.

Habits are hard to break and since the word atomic has been used for almost two decades it may be too late to make this change.

Market Development

Calectric Booklet Gives Facts on Insulation

How insulation can be used to cut air conditioning equipment and operating costs is the subject of a booklet being mailed to customers by California Electric Power Co.

Using an average-sized home of 1,300 sq ft as an example, the booklet points out that for investment of $250 for 3-in.-thick reflective foil-enclosed insulation batts in the ceiling and 2-in.-thick batts in the wall, the size of required electric air conditioner can be reduced from a 7- to 10-ton unit to a 2½- to 3½-ton unit.

What this means, according to O. J. Schmitt, Calectric air conditioning sales agent, is that with $250 worth of this kind of insulation, the individual can save $2,000 in equipment cost and $23 per month operating cost. The 7- to 10-ton unit required by a 1,300-sq-ft home without insulation would cost about $3,500 installed and $36 a month to operate. With proper ceiling and wall insulation, a 2½- to 3½-ton unit can be purchased and installed for $1,500 and can be operated for about $13 a month.

Relationship of insulation to air conditioning cost outlined in the booklet was not determined in any haphazard way, Schmitt said. It was determined by controlled and metered tests in homes with and without insulation. These tests showed that the most effective insulation was reflective foil-enclosed insulation batts.

Many homes in desert areas served by the company have open-beamed ceilings. For this type of construction, Calectric recommends a minimum of 3-in. insulation board in the roofing.

For the person who already has air conditioning in a home without proper insulation, Calectric offers tips to cut operating costs.

► **Hawaiian Electric** Co. won three first awards in the PUAA Better Copy contest. It took top place in its division for a series of newspaper ads on a public relations subject, a single newspaper ad promoting the use of utility service and a single ad selling merchandise. It won a second place award for its annual report.

► Southern California Edison Co. won first place for its newspaper advertising in a nation-wide contest sponsored by the Public Utilities Advertising Association. For the second consecutive year, it also won first place for the best motion picture to be produced by a utility, with its "Highlights of 1959."

Electric Heating In Seattle

More than 40% of all housing units for which Seattle building permits were issued during the first four months of 1960 will be heated with electricity, according to figures compiled by Seattle City Light.

The high percentage is due to electric heat's predominance in the apartment house field, with 414 of 494 apartment units to be heated electrically. The all-electric rate will apply to 441 units, meaning that electricity will be used for cooking and water heating as well as lighting.

The percentage is much lower in single and multiple-family residences. Of the 794 units applied for, only 92 will have electric heat installations, although all except six qualify for the all-electric rate.

► **Southern California Edison** predicted that it would again lead the nation's utilities in 1960 in the Medallion Home program. The prediction by T. M. McDaniel Jr., Edison vice-president, was based on the trend indicated by the first four months of this year. Even though the number of housing starts in its service territory was down 16% as compared with the like period in 1959, Edison reported an increase of 70% in Gold Medallion contracts. Bronze Medallion agreements are also ahead of the 1959 pace.

► **Sacramento Municipal Utility District** will discontinue its electric range repair service policy. SMUD officials say that when the district first went into operation there was a demand for the service but the work load has dwindled and its operation is no longer justified. Appliance dealers welcomed the decision. They have been trying for many years to get SMUD out of the repair business.

► Three electric utilities in the Tri-City area of southeastern Washington have jointed in a **promotion of air conditioning** that includes tie-in advertising from a number of dealers in the area. The promotion was kicked off June 3 by the Benton County Public Utility District, Franklin County Public Utility District and the Richland Electric Utility with a color ad in the Tri-City Herald, Kennewick, Wash.

Refrigerators are "Most Wanted"

Refrigerators are the "most wanted" major appliance in northern and central California, according to response in Northern California Electrical Bureau's $20,000 Electrical Prize Drawing. According to B. W. Reynolds, bureau manager, more than 75,000 participated by depositing entry blanks in dealer stores.

Entry blanks were sent out with Pacific Gas and Electric Co. bills to approximately 1,800,000 electric customers. A space was provided for customers to write what electric appliance they would buy next. Choice was unrestricted, with the result that 84.7% listed a major appliance; 6.6% a portable kitchen appliance and 8.7% a housewares appliance.

Refrigerators received the largest rate of response with 16.6%, followed by washers with 14.5% and TV with 11.8%.

Among portable appliances, frypans were selected by 1.6%, mixers by 1.2% and toasters 1.0%. Equipment for musical reproduction was listed by 2.3% and a total of 17 other kinds of equipment ranged from vacuum cleaners to hedge clippers.

Percentage data were taken from a sample of 4,380 entries selected at random. The following tabulation extends percentages to 75,000 of the entries.

Major Appliance	Per Cent	Projection of Entrants
Refrigerator	16.6%	12,400
Washer	14.5	10,900
Television	11.8	8,800
Range	11.2	8,400
Freezer	10.7	8,000
Dryer	8.6	6,500
Dishwasher	5.5	4,100
Washer-dryer combination	4.5	3,400
Air Conditioner	1.0	800
Water Heater	0.3	200
Total	**84.7**	**63,500**
Portable Kitchen Appliance		
Frypan	1.6	1,200
Mixer	1.2	900
Toasters	1.0	800
Coffee Maker	0.8	600
Waffle Iron	0.7	500
Rotisserie-roaster	0.7	500
Miscellaneous	0.6	500
Total	**6.6**	**5,000**
Housewares		
Hi-Fi, stereo, tape recorder, phonograph	2.3	1,700
Vacuum cleaner	1.8	1,400
Iron (hand)	1.3	1,000
Radio	1.1	800
Miscellaneous (14 appliances, each less than 0.5%)	2.2	1,600
Total	**8.7**	**6,500**
Totals	**100%**	**75,000**

► **Edna Poyner,** home economist for Norge on the Pacific Coast, has been transferred to Chicago as assistant home service director for that company. She will work directly under Jessie Cartwright, director.

► **Frank Kitzmiller** Jr. has been named to a new position, inter-industry coordinator, for the Live Better Electrically Program of EEI.

One-Millionth Customer

The one-millionth electric meter in metropolitan Los Angeles has been installed at North Hills Estates in Northridge, a Medallion Home development. A plaque to commemorate the occasion was presented to the builder, I. A. Temple, by the Los Angeles Department of Water & Power.

Push Air Conditioning

One of the largest air conditioning sales promotion campaigns ever conducted in eastern Washington and northern Idaho was begun recently by the Inland Empire Electrical League. More than 175 dealer representatives attended a league-sponsored air conditioning forum at the Washington Water Power auditorium.

After a two-week build-up with daily and weekly newspaper ads and radio spots on seven stations during May, the promotion is continuing newspaper ads and radio spots through July 30.

League officials feel there is a big market for air conditioning. Residential saturation in the territory covered by league dealers is only 6%. Commercial saturation is only 12%. Both central units and room air conditioners are being plugged in the campaign.

Despite the relatively low saturation for air conditioners in the league territory, officials said there has been increased interest in air conditioning. April 1960 sales included 168 room units and 42 central units, compared with 29 room units and 18 central units for the same month last year.

All Washington Water Power Co. offices will display air conditioning units as part of the promotion.

► EEI is offering a new **kitchen planning slide presentation** called "Mrs. Tilley and Her Lemon Pie Kitchen!" Complete kit ($35 for members; $40 for nonmembers) may be secured from Sales Division, Edison Electric Institute, 750 Third Ave., New York 17, N. Y.

Association Affairs

For 12 years now once a month inspectors and contractors have met in San Diego. At head table: Harry Shopp, chief electrical inspector, San Diego County; Burke Breedlove, San Diego Gas & Electric; Arthur P. Vesco, chief inspector, San Diego; George Byrum, Atlas Electric; E. C. Phillips, Coast Electric Co.; and K. Sturges, manager, San Diego NECA

Inspector Coaching

For 12 years now electrical inspectors and contractors have met for lunch on the first Monday of each month in San Diego to discuss and iron out any of their mutual inspection problems. Approved by then City Manager Fred Rhodes in 1948, they have been held regularly since.

Meeting chairman is usually Arthur P. Vesco, chief electrical inspector, San Diego, and in attendance are Chief Inspectors Harry Shopp, San Diego County; Ed Quinn, city of El Cajon; Reno Whetcraft, city of La Mesa; Ed Grady, city of Chula Vista; Robert Stephens, city of National City and as many of their inspectors who can attend.

Also attending are electrical contractors, representatives of NECA, San Diego Gas & Electric Co., wholesale distributors and members of the local union.

Code interpretations and utility service rulings are discussed. A question and answer period follows on each subject. Attendance is from 40 to 50. These meetings have brought a better understanding and a spirit of cooperation in the electrical industry. Arrangements are made and announcements sent out by the San Diego Chapter of NECA.

Round table discussions are encouraged for the specific purpose of assuring standardized inspection procedures and interpretations in the area. They likewise provide an opportunity for contractors and inspectors to become better acquainted.

Some of the new officers of the Idaho Chapter, IAEI, elected at Twin Falls. Standing: A. L. Callow, first vice-chairman; Leslie G. Nelson, retiring chairman. Seated: Jack Schwartz, new secretary-treasurer, and Gaylord Denison, former sceretary-treasurer, now second vice-chairman. New Chairman Delbert Squires was not present

IAEI

Idaho Chapter, International Association of Electrical Inspectors, held its annual election at its recent annual meeting in Twin Falls, reported last month. However, the new officers were not announced in the roundup. They are: Delbert Squires of Nampa was elected the new chairman to succeed Leslie G. Nelson of Buhl, who goes on the

Flexibility that works for you...

...WORKS FASTER AND EASIER ON THE JOB!

Foot-by-foot flexibility of Royal portable cord makes it the easiest handling, fastest working cord you can use on any job. Royal rates *first* among electrical men everywhere because it is quality-controlled to meet *all* the high performance standards you look for in portable cord — safety, flexibility, durability, dependability.

Next time you order flexible cord, specify Royal. Your wholesaler has a complete range of Royal types and sizes — rubber, neoprene, and plastic jacketed cords, power cables, thermostat cable, lamp and fixture wires, machine tool wires, and heavy-duty "POWR-KORD" extensions. Priced right, too!

ROYAL ELECTRIC ...an associate of

ROYAL ELECTRIC CORPORATION
PAWTUCKET, RHODE ISLAND

SALES REPRESENTATIVES AND WAREHOUSES: Los Angeles—1950 Naomi Avenue, RI 7-9655; San Francisco—1225 Sixth St., HE 1-5792; Seattle—4130 First Ave., So., MA 3-8882; Denver—888 S. Lipan Street, WE 6-3456

executive committee. A. L. Callow, St. Anthony, is first vice-chairman; Gaylord Denison of Coeur d'Alene, second vice-chairman; and Jack Schwartz of Boise, secretary-treasurer. Ralph Foley, Twin Falls, Don Baird, Caldwell and Nelson were placed on the executive committee.

Although the Boise division of the chapter was dissolved, it is only because considerable activity emanates from there and a separate organization is not felt necessary. Mark Lundy, chief electrical inspector of the Idaho State Electrical Board, has been carrying on meetings throughout the state on the 1959 National Electrical Code which became effective in the state May 1, 1960. Some 18 meetings in all were held throughout the widespread state. In these changes in the code were enumerated and open discussion held on them. Contractors, journeymen, city and state inspectors, and power suppliers attended these meetings.

► **Utah Chapter, IAEI,** also elected its annual slate of officers at its recent annual meeting reported last month. The new chairman of the chapter is Lloyd M. Grames, engineer, Board of Fire Underwriters of the Pacific; Aaron Clinger, Orem city inspector, first vice-chairman; V. C. DuVander, Utah Power & Light Co., second vice-chairman; and Theron Haws, Provo city inspector, secretary-treasurer, for the first time that office has been away from Salt Lake City. Grames succeeds William Whetton, Ogden city inspector, and Haws succeeds the long-time secretary, A. H. Bywater of Pacific Fire Rating Bureau.

The Utah Chapter passed a resolution to continue its drive for state inspection.

Responsible for arrangements for the annual meeting were Arty Clark, consulting engineer, general chairman; Amos Bronson, chairman, finance committee; J. R. Petree, chairman, program committee; Les Johnson, publicity and attendance; Hyde Stayner, banquet and entertainment; L. M. Grames, hotel and registration; D. J. Wolters, friendship hour.

► Another area meeting group has been formed by the **Electrical Maintenance Engineers Association** of California in the Mojave Desert. Work on such formation started with a preliminary meeting March 16 at Ridgecrest and regular meetings began in April. Donald Higgins, American Potash & Chemical Co., was appointed general chairman. Committees for both the south and north ends of the area

were also named. Ben Sedgwick, Edwards Air Force Base, is south chairman; Bill Turnbull, American Potash & Chemical Co., north chairman.

► **NAED's** northern California area meeting, originally scheduled May 27 and 28 at the Flamingo Hotel in Santa Rosa, was moved a week ahead to May 20 and 21. A workshop program was conducted during the day with a golf play on Saturday.

EMEA

Growing attendance and interest is reported by the reactivated Electrical Maintenance Engineers Association of Northern California as evidenced by its past two meetings in April at El Cerrito and May at Niles. Attendance at El Cerrito was 85 and Niles 95, with the next meeting scheduled June 9 at the Pacific Gas and Electric Co. test laboratories in Emeryville. Three of the original officers, Fred Gerick, Ed Price and Lloyd Hall, all of Mare Island, were given honorary memberships at the April meeting, at which the officers were permanently elected for this year. Because of his leadership in reactivating the group, Jack Singleton, Pacific States Steel Co., was elected president; Don Miller, substation maintenance specialist, PG and E, first vice-president; Fred W. Gerick, Mare Island, second vice-president; and John Billings, GE service shops, secretary-treasurer.

Format for the meetings has been approved by membership increase and attendance. E. E. Carlton, supervising electrical engineer, California State Division of Industrial Safety, addressed the April meeting on codes and safety orders. At the May meeting a short talk and a question and answer period on codes was presented by Ernest Nelson, San Leandro chief electrical inspector. Bert Smith addressed the May meeting on the state's water resources, an important asset to industry.

► **Snake River Valley Electrical Assn.** at a special board of directors meeting appointed Walter Wallich of Gem State Electric Co. treasurer to serve out the term of Mrs. Edna Young, treasurer, who resigned because of family circumstances.

► **San Diego Electric Club's** annual Motor Winding Contest among students of the high schools of the county brought forth the winners at its May 23 meeting, when 50 contestants were entertained at the luncheon. Each student and his sponsor were at the meeting, and H. G. Dillin, executive vice-president, San Diego Gas & Electric Co., presented the awards.

► **American Power Dispatchers Assn. Inc.,** held its spring national meeting May 6 and 7 with the California Electric Power Co. dispatchers as hosts in San Bernardino. Fred Niemeyer of Calectric, association president, was in charge. Willis T. Johnson, vice-president and assistant general manager of the company, talked on "Power Pooling in the Southwest Area." Field trips on Saturday included a visit to Southern California Edison Co.'s Mill Creek No. 1 plant, the first three-phase hydroelectric generator in the U. S., installed in 1893. The new Calectric San Bernardino steam plant was also visited. S. H. Gold, electrical engineer of the company, addressed the members on "What Voltage Dips Mean to the Engineer." Dispatchers from the Canal Zone, city of Seattle, Arizona Public Service, PG and E, and others from southern California attended.

► **Electrical specialists** were among the speakers at the May 26 meeting of the Society of the Plastics Industry at Mayfair Hotel, Los Angeles, when "Plastics in Illumination" was the theme. On the panel, representing electrical end users, were Mitch Bobrick, Sunbeam Lighting; Roy Kreyser, Los Angeles Department of Water & Power; Robert Simpson, Victor Gruen & Associates; and Robert S. Clubley, General Electric Co.

► New Jack Tar Hotel in San Francisco provided the joint meeting of the **Golden Gate Section, Illuminating Engineering Society,** and the **American Institute of Electrical Engineers,** with a meeting and a tour May 20. Lloyd G. Dehrer, chief electrical engineer, Buonaccorsi & Murray, consulting engineers, and James L. Dellos, superintendent for Emil J. Weber Electric and Brayer Electric companies, the electrical contractors, described the lighting and electrical systems, and the large group of some 250 toured the hotel.

► **East Bay Electric Club,** Oakland, Calif., nominated for next year's president, Herbert Arnett of Graybar Electric Co., and for vice-president Bob Scholls, General Electric Co. Charles Matthews, Standard Electric Supply, was named secretary-treasurer, and directors will be Ted Buttner, George Baker and Ernest Nelson for a two-year term. Bill Gribble, retired, headed the nominating committee.

(More association news on page 84)

*Trademark

Fine Fanner Superformed Products

"Superforms* help me get better results for my clients" ...CONSULTING ENGINEER

"It's my responsibility to get the best possible results for my clients . . . the most for their T&D construction dollars . . . installations that will stand up under severest conditions, over long periods of time. Fanner Superformed products help me meet these requirements."

More and more Consulting Engineers are making Superforms a standard in their specifications. A-1601A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS... Protect long-span T&D lines at supports

LINEGUARDS... Protect short-span T&D lines at supports

PATCH RODS... Repair damaged conductors

TAP ARMOR... Protects conductor at tapping points

FANNGRIPS... For dead-ending strands and conductors

FANNSPLICES... Join two ends of conductor wire

PLASTIC PRODUCTS... For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

If you need condenser and heat exchanger tubes for critical service...

Specify **Phelps Dodge**... a major supplier for nuclear projects!

Phelps Dodge condenser and heat exchanger tubes are currently in use in nuclear energy applications where highest quality and exacting specifications are essential.

Every Phelps Dodge tube intended for use in a nuclear project undergoes a series of severe tests to assure rigid conformance to the required specifications and ability to perform under the rigorous service conditions found in this highly specialized field. Testing facilities used by Phelps Dodge cover not only standard ASTM specifications but also include these special non-destructive tests:

- Eddy-current inspection
- Dye penetrant test
- Ultrasonic inspection

To keep pace with the steadily growing importance of the nuclear power field, Phelps Dodge has opened one of the largest tube mills in the world at South Brunswick, N. J. This mill has the most modern automatic tube fabricating machinery, the finest research laboratories and the most advanced testing equipment.

Inquiries regarding your condenser and heat exchanger tube needs, particularly those requiring Electronic and Penetrant Tests, are invited.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 PARK AVENUE, NEW YORK 22, N. Y.

PD

For phone number of closest representative see advertising index in back of book.

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. VOL. 125, NO. 1 JULY 1960

Southern California Edison study points trends as a result of . . .

UNDERGROUND COST COMPARISON

R. C. BLANKENBURG, SUPERVISOR OF UNDERGROUND, SOUTHERN CALIFORNIA EDISON CO.

The purpose of this study is to determine the cost relationships of serving residential underground as influenced by primary voltage, type and location of transformers and transformer spacing. Three type location combinations are:

1. Vaults in parkway.
2. Pad transformers on parkway.
3. Pad transformers on rear lot lines.

Three primary voltages are considered: 12 kv delta, 2,400/4,160 Y and 480/832 Y.

Unit demands of 2.5, 5, and 10 kva are studied to give a measure of growth performance.

A maximum diversity factor of three is used. Individual demands are computed at three times the diversified value for service voltage regulation. In any group it is considered: 12 kv delta, 2,400/4,160 Y three times average value while all others have the average peak demand. For example, a group of four is considered to have a group peak of six times the average. Secondary voltage regulation is computed on this basis. All schemes are duct lay systems.

Relative Costs

Total costs are measured from 12-kv main feeders to the load ends of the service cables. These costs include current material and labor rates, overhead and losses. Losses are evaluated at 3 mills plus historical plant costs per kw. Joint construction with the telephone utility is assumed and trenching costs are allocated on this basis. The cost of trenching and service duct on the lot is *omitted,* but the cost of service cable is included.

All costs are relative to 4,160-v vault-type construction with 5-kva diversified demand. The study presupposes favorable soil conditions and geometrical plot plans. Facilities for sectionalizing and disconnecting primaries are provided. Primary circuits are arranged to accommodate growth in adjacent areas. Spare duct and vault space to meet reasonable growth are included.

Actual costs have been avoided in this presentation. The purpose is to achieve a high degree of relative ac-

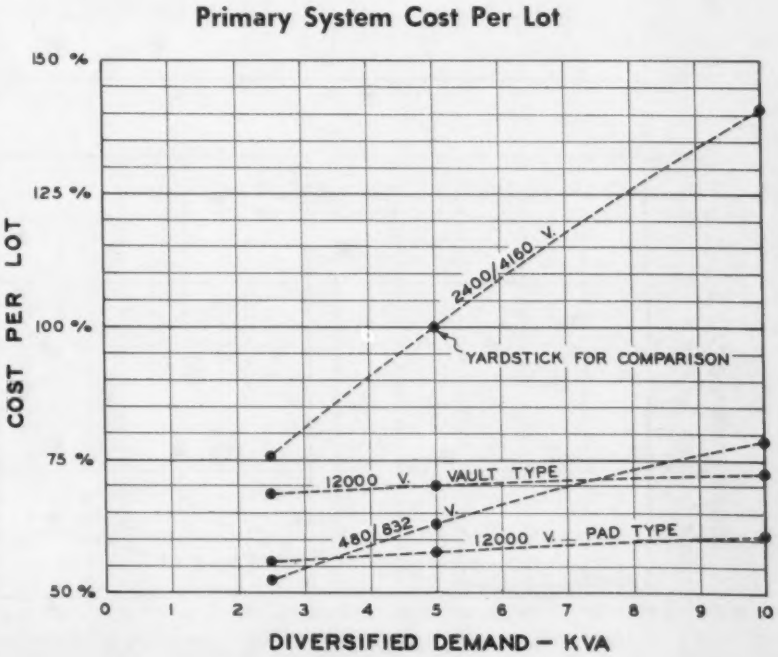


Fig. 1—The elements of cost in each relative amount:

1. All primary cable within the limits established for these studies

2. All duct for these cables, including spares

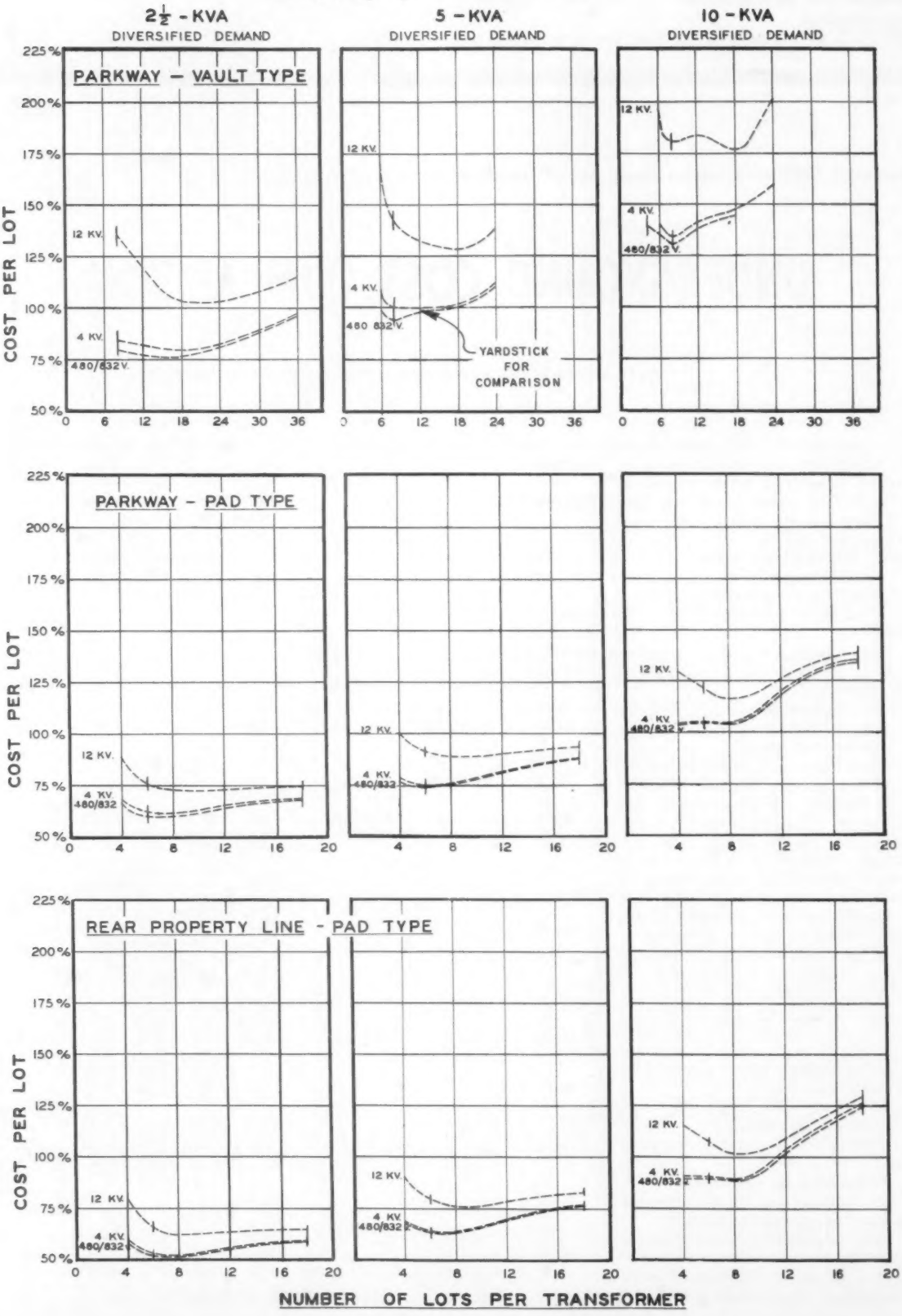
3. All trenching for these ducts

4. All manholes and similar enclosures only where no secondaries exist

5. All switchgear for sectionalizing excepting local switchgear for 12-kv vault type

6. Plant investment to provide for losses in the primary system of each plan

Secondary System Cost Per Lot



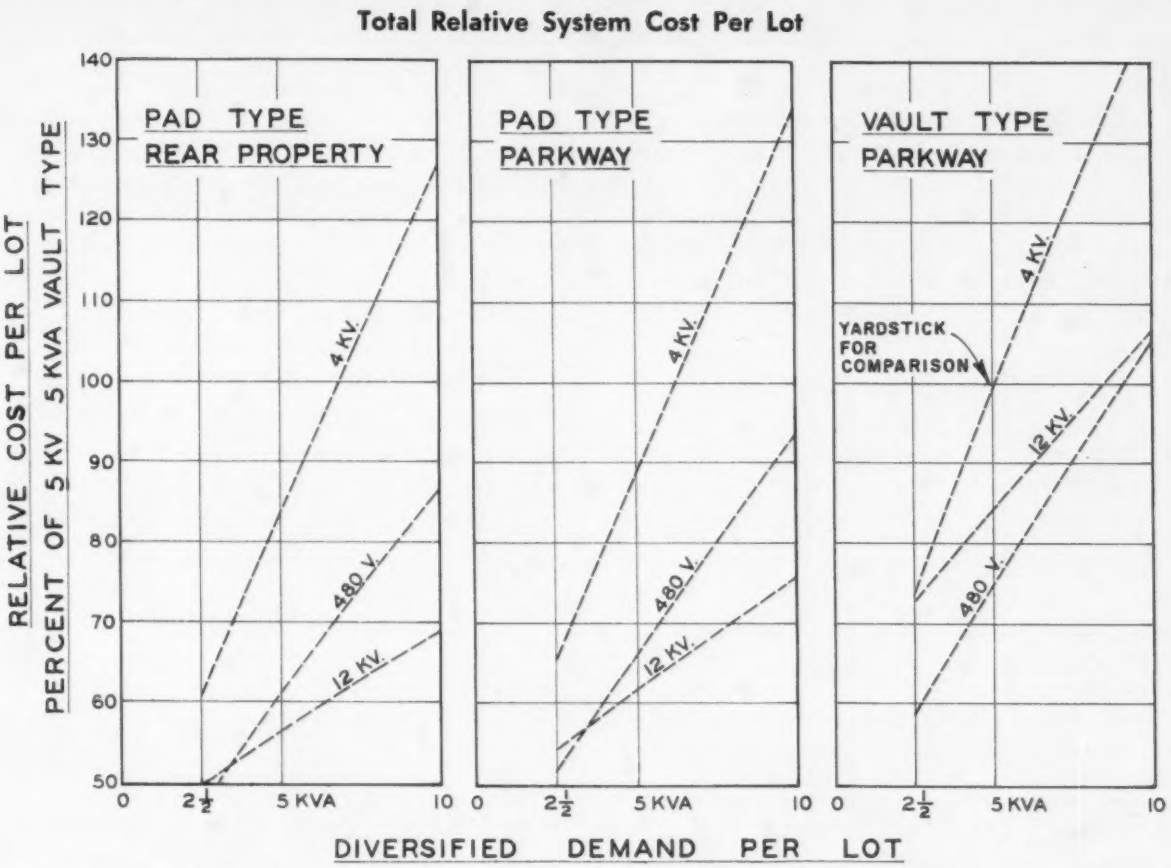


Fig. 3—Relative costs include items detailed in Figs. 1 and 2, plus 12 kv-480 station costs for the 480-v systems under consideration

curacy! The feeling is that unless there are bold economic trends discernible, as a function of the nine prime variables, then the selection of a system may hinge on market prices, i.e., the relative cost of rubber and lead cable.

Fig. 2 – Elements of cost in each relative amount:

1. Secondary and service cable
2. Ducts for these cables
3. Trenching only where no primary exists
4. Transformers, including local switchgear and extra cable in the case of 12-kv vault type
5. Transformer emplacement
6. Splice enclosures along the secondary runs
7. Plant investment to provide for losses in the secondary system of each plan

Regulation limited to 3% maximum in secondaries and services

Treads Identified

As a result of this study the following conclusions, portrayed in chart form, have been reached.

12-kv best primary – The notion prevalent in the industry that 4 kv is the ideal underground voltage has been refuted. Both 480/832 Y and 12 kv prove to be less costly than the 4-kv primary voltage. In view of the fact that the 12- to 480-v transformation must be done in banks above 500 kva to be economical, there is a strong implication that 12 kv is a good standard voltage. Another point favoring 12 kv is that it is better suited to growth of demands than other voltages.

Pad mounted systems best—Enclosure costs made vault-type construction more costly than pad mounting. Between the two pad-mounted systems studied, rear property line appears slightly less costly than parkway construction.

Lots per transformer—This factor is most critical with vault-type construction and becomes more important as demand increases. Based on 12-kv primary, the indication is that some standardization may be possible without an excessive premium.

Steady Pays Off

A final generalization can be made. Fig. 3 makes the point clearly that there are significant cost differences – on the order of 2 to 1 – between commonplace methods of accomplishing the same task. As time goes by and demand increases, these differences will become more marked.

Underground distribution, because it is a developing technology, will demand increased engineering study compared with overhead in order to achieve minimum cost. Recent product developments and new methods hold high promise for reducing the gap between the cost of overheard and underground distribution.

Like Henry Ford's reasoning with the Model T — if you can reduce the cost so that it is within the reach of most men, then a desirable product will sell and sell big. PGE management could sense a rising demand for residential underground, but the cost premium required of the developer usually killed the deal.

With the advent of pad-mounted transformers it became apparent that the overhead vs underground cost differential could be reduced in residential areas.

A study of costs for several subdivisions indicated that underground systems could be installed for an average cost of approximately $150 per lot in excess of the overhead cost. A major reason for this low figure is the use of direct burial cable. Achieving this cost differential depends on the close control of materials and careful planning to insure that only the essential elements necessary to install and maintain adequate and continuous service are included in the design.

Developers are enthusiastic. The majority of new residential developments in PGE territory are to be served underground.

Here are the reasons, the how and why of the decision to use direct burial cable.

Task force analysis of four key factors leads PGE to . . .

DIRECT BURIAL RESIDENTIAL UNDERGROUND

A. T. JOHNSON AND ORIN F. ZIMMERMAN, ELECTRICAL ENGINEERS, DISTRIBUTION DEPARTMENT

The committee assigned the task of setting design specifications for residential underground is composed of engineering and operating people.

General agreement was quickly reached among departments of the company, including those responsible for installation, insofar as most portions of the underground design were concerned.

One major point of discussion within the committee itself and with the company people interviewed by the committee was the question of direct burial cable vs duct runs. It was agreed that, if at all feasible, duct runs should *not* be used because of the immediate added capital cost. It was management's opinion that the residential underground system should be designed for the lowest capital cost consistent with a reasonable expected annual maintenance cost and service reliability. The company further felt that it was its duty to go as far as was reasonably possible to make the installations acceptable from the aesthetic point of view. This philosophy provided the group a starting place for engineering design. Conductor portions of the system would be designed to serve the maximum expected residential load over the next 30 years.

In most developments it appeared that the capital cost of installing looped primary feeds would be more than offset by the savings made by eliminating duct runs from the designs. The looped feeds would provide for ready restoration of service in the event of damage to the primary cable and facilitate transformer changeout. Thus, repair and maintenance would become a routine operation to be performed during normal working hours.

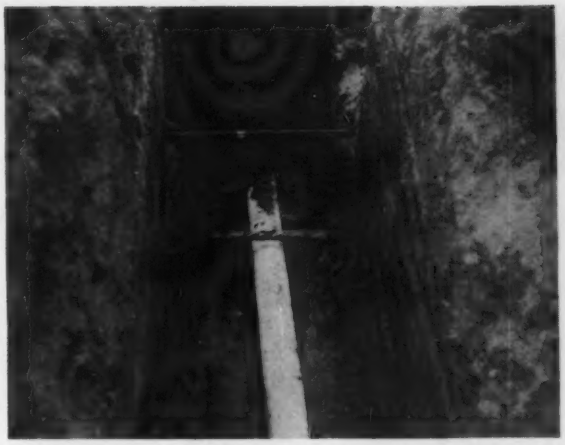
Some of the engineering and operational factors considered in arriving at the decision to use direct burial cable follow.

Experience

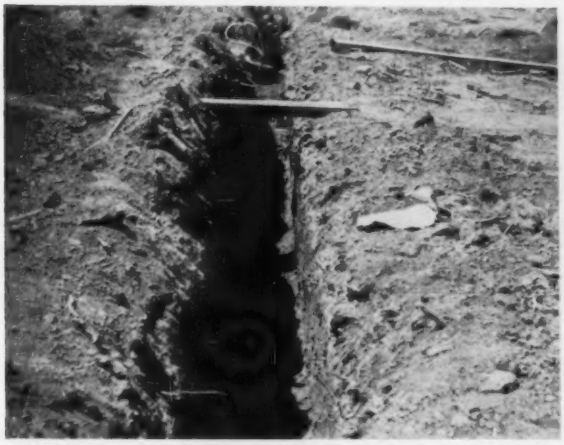
PGE's experience, dating back to 1954, was with a small amount of residential underground installed using 15-kv cable on a 4,150-v primary. This system has since been cut to 12.5 kv wye. The new systems are installed at 12.5 kv wye. A review of the troubles experienced with the original installations indicated that most of the accidental faults to the system were due to shallow burial. In most cases the location of physical damage to the cable was readily apparent from surface conditions. Only steel conduit or fiber encased in concrete would, in most instances, give any real physical protection to the cable. This led to specification of a minimum depth of 36 in. for secondary and 48 in. for primary on new installations. In most cases the primary trench is actually dug to a depth of five feet. Thus, experience indicated that low-cost duct installations would be useful mainly for the replacement of cables.

Also considered was the reduction of capacity of conductors installed in ducts as compared to those directly buried. Previous experience with duct system damage and resultant cutting of conductors in construction areas because of earth set-

Hand-guided power trenchers and favorable soils in the Portland area reduce the cost of trenching to a minimum

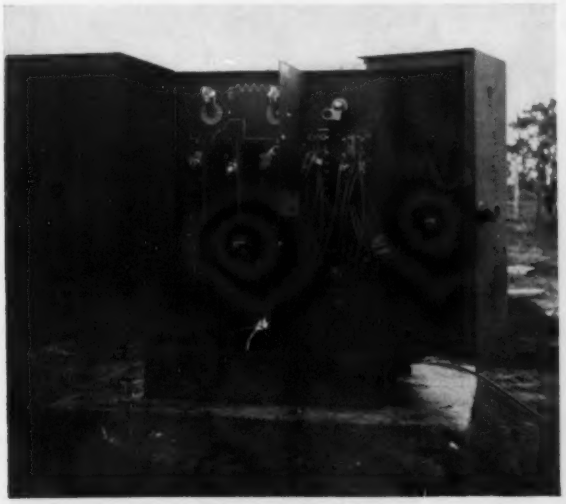


The sewer run made it by this spot with no difficulty. Marking, mapping and coordinating result in lack of damage



With the primary conductor in place, one foot of soil is backfilled. Secondary cables are exposed in trench

Transformer pad location shows primary and secondary risers stubbed off prior to transformer installation



As job nears completion, pad-mounted transformer is put in place, primary and secondary connections completed

Secondary splices are direct buried. At left neutral connection, at right hot legs clamped and finish taped

Customers' underground service entrances. PGE makes direct buried splice of Fig. 6 about 4 ft from the customer's building

Careful mapping and coordination, use of cable location markers such as above prevent damage to cable during construction

tling was also a factor in the final decision.

Earth Conditions

Earth conditions in the PGE service area offer two natural conditions favorable to direct burial construction. The soil in the Willamette Valley, the major portion of the area, is sandy loam, free of rock and shale. This reduces the chance of damage to the cable by sharp objects. Furthermore, this type of soil permits very easy excavation to the minimum four-foot depth. In many areas PGE has been able to use the existing soil as a direct backfill, thus obviating the necessity for the usual sand cushion.

Conduit or fiber ducts are installed under streets, railroads or through rocky areas where danger of mechanical damage is high. In some locations ducts are installed for future use to prevent breaking of pavement, etc.

The new hand-guided and readily portable power ditching machines have made installation and maintenance ditching on back lot lines practical and less expensive.

Design specifications call for all primary taps to be made within the terminal housing on the pad-mounted transformers. Primary cable runs are made continuous from transformer to transformer without splices. Electrical cable failures due to human errors or poor workmanship are thus minimized.

Safety

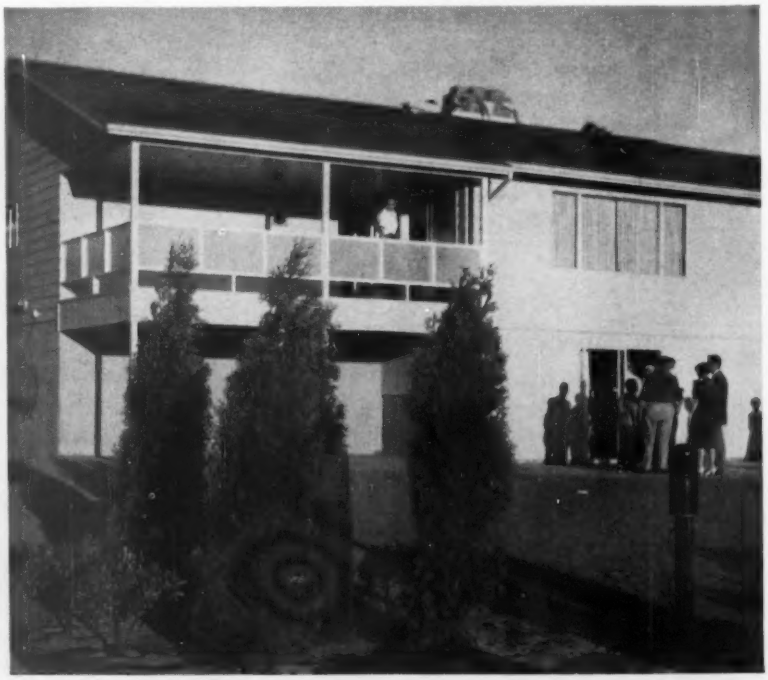
Insofar as safety considerations are concerned, it is felt that the choice of a shielded, 15 kv, copper cable with a concentrically wound outer neutral offers more than adequate protection to anyone driving metal objects into the energized cable. Here again the depth of burial is a factor.

Repair Methods

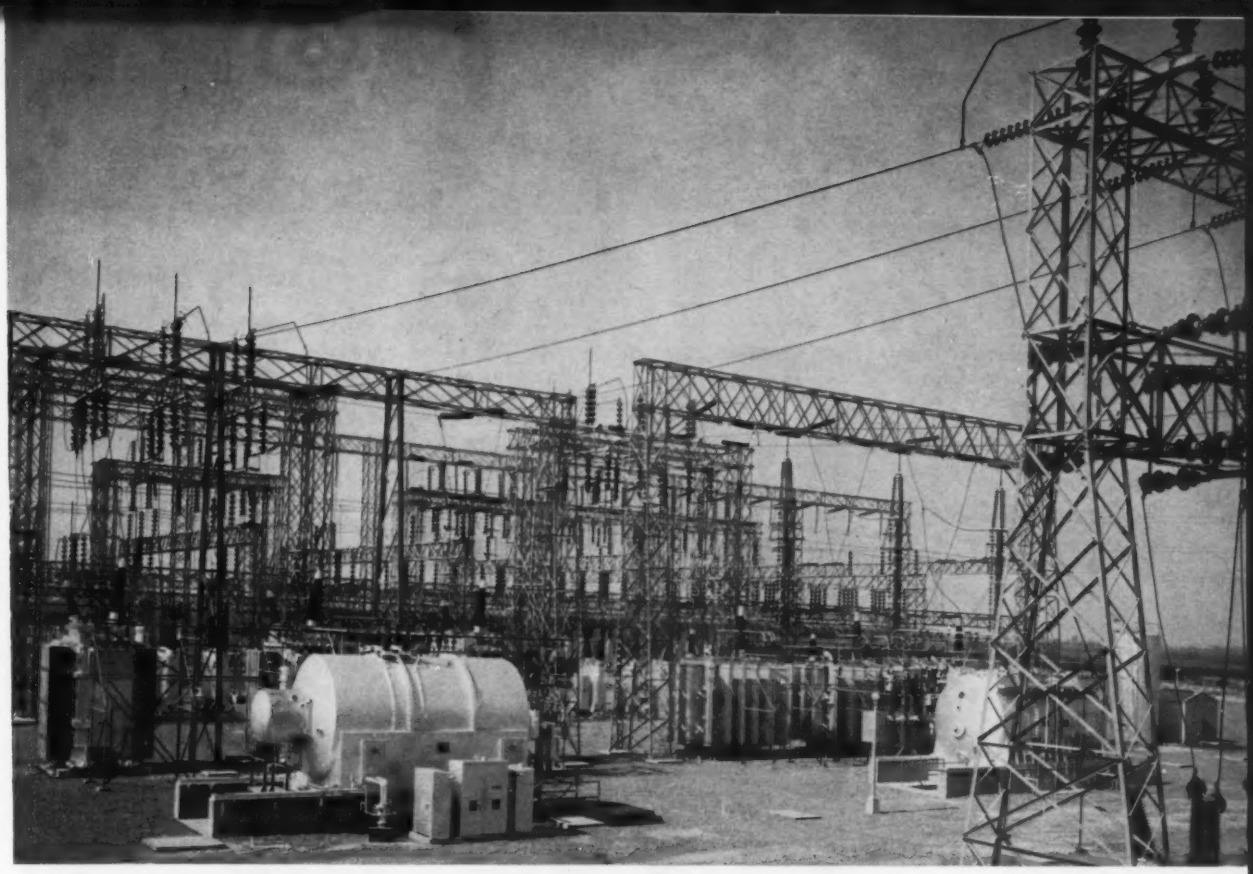
The few faults experienced on present residential underground systems have been caused by mechanical equipment. These machines would have penetrated most protective coverings other than steel or concrete. The locations of these faults were readily apparent.

As mentioned, primary taps are made in the transformer enclosure eliminating the possibility of splice failures. Cable insulation failures can be accurately located by modern electronic fault locators. Also, the portable trenching equipment makes it possible to replace whole sections with a minimum damage to backyard gardens.

The feeling of the group is that only experience would give the final answer. Initial installations of duct runs, at added capital cost, without first attempting at least some installations utilizing direct burial cable would never tell when progress in the art made direct burial possible. Conversely, however, if direct burial cable gave an unsatisfactory record of service, the incremental cost of adding ducts in future installations could be very easily justified. As a result of this analysis, the decision was made to use direct burial cable. Thus far, experience shows satisfactory performance.



Finished product rates high with builders and home owners. Landscape helps hide transformer. Note telephone termination right foreground of photograph



PG and E's McCall substation where tests prove new . . .

AIR BREAK SWITCHING APPLICATIONS

H. J. ERLING, SENIOR SUBSTATION ENGINEER, DEPARTMENT OF ELECTRIC OPERATION, PACIFIC GAS AND ELECTRIC CO.

Over the years PG and E engineering and operating personnel have sought to reduce the number of circuit breakers in stations. Ideally, circuit breakers should only be used where faulty current protection is required, and there only if the equipment cannot be adequately protected with fuses. The switching function, if it can be achieved by lower cost switching devices, offers rich opportunity to reduce capital costs, station size and breaker maintenance.

For some time PG and E has used, as units, the required size of low voltage disconnects with 600-amp interrupters of the same voltage class. This combination provides disconnects of the correct size to carry bank loads, facilities to interrupt the charging current of banks and facilities to break or re-establish parallels with other banks. The fact that the load current may be considerably greater than 600 amp and the entire load current is carried by the 600-amp interrupter during the breaking and re-establishing of a parallel does not cause concern because of the momentary capacity of the interrupter.

Prior to tests recently made, however, PG and E had not tried 110-kv air switches equipped with 34.5-kv interrupters to break parallels in the 110-kv system. There was little experience with 110-kv air switches equipped with quick-break devices to interrupt charging current. With this in mind, a series of tests was arranged at McCall substation to establish the following:

1. Would the unit of 110-kv air switch and 34.5-kv interrupter break the parallel between companion banks at a substation, or break the parallel of transformer banks with transmission lines in series with the banks?

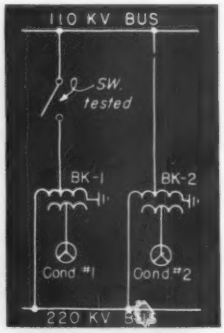
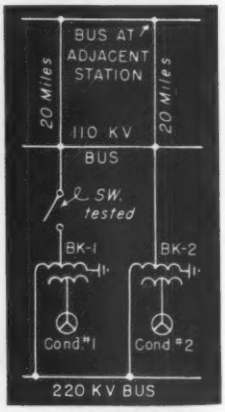
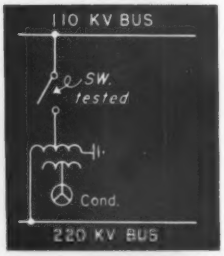
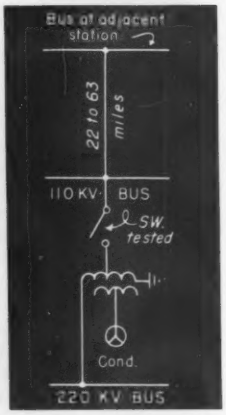
2. Would the unit of the 110-kv air switch and quick-break device successfully interrupt transformer bank charging equipment, withstand transformer inrush current, interrupt 110-kv line charging current or energize 110-kv lines?

Summary

A 110-kv air switch with a 34.5-kv interrupter unit will successfully break and re-establish parallels even though relatively high network impedance exists. It was established that 110-kv air switch quick-break units will successfully energize or de-energize any transformer bank we now have at substations and 110-kv lines up to 50 miles in length. Obviously the interrupter cannot be used to de-energize equipment because of its limited voltage rating. The quick break is not completely satisfactory for breaking parallels because of its limited thermal capacity. Even though the equipment has some limitations it is of real value if properly applied.

Six Tests at McCall Station

The following chart outlines the six tests made at McCall. This sub is a 220/110 kv station with two auto banks, each having an FOA rating of 120 mva and two synchronous condensers, each rated 48 mva.

Description Of Objective	Circuit Diagram	Conditions	Results
Test No. 1—Open and close a 110-kv air switch equipped with 34.5-kv interrupters to break and establish the parallel between two transformer banks.		Total load on the two banks was 80 mva at pf of 90% lagging. Individual bank impedance was 10% on a 100-mva base. 40 mva through the switch being tested.	Both closing and opening operations were successful. No evidence of arc. 4-kv potential measured across switch in open position.
Test No. 2 — Same as above with 110-kv lines in series with each bank.		System arranged to put 36 mva at a 75% pf lagging through the switch to be tested.	Both closing and opening operations were successful. No evidence of arc. 7-kv potential measured across switch in open position.
Test No. 3—Open a 110-kv air switch equipped with a quick-break device to interrupt the charging current of a transformer bank.		Steady state charging current 3-4 amp. Opening speed of quick-break arm 23 in. per cycle.	Successful. 12 operations with minor arcs. Arcing time eight cycles.
Test No. 4—Close a 110-kv air switch equipped with a quick-break device to charge a transformer bank.		Closing speed 7 ft per cycle. Quick-break device not in circuit during closing operation.	Successful. 18 operations with minor arcing. Bank inrush current about 200 amp.
Test No. 5—Open a 110-kv air switch equipped with a quick-break device to interrupt the charging current of 110-kv transmission lines.		110-kv lines ranged in length from 22 to 63 miles. Opening speed of quick-break arm 23 in. per cycle. Line charging current about .5 amp per mile. Lines—22 to 63 miles. Quick-break device not in circuit during closing operation. Closing speed of switch blades 7 ft per second.	Lines de-energized 41 times successfully. Equipment reliable for interrupting 110-kv line charging currents up to 50 miles.
Test No. 6—Close a 110-kv air switch equipped with a quick-break device to charge 110-kv lines.			Successful. 43 operations. Minor arcing.

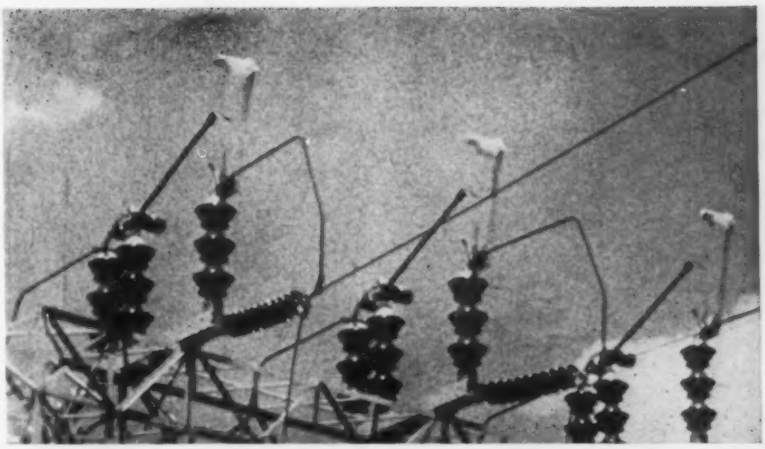
Application

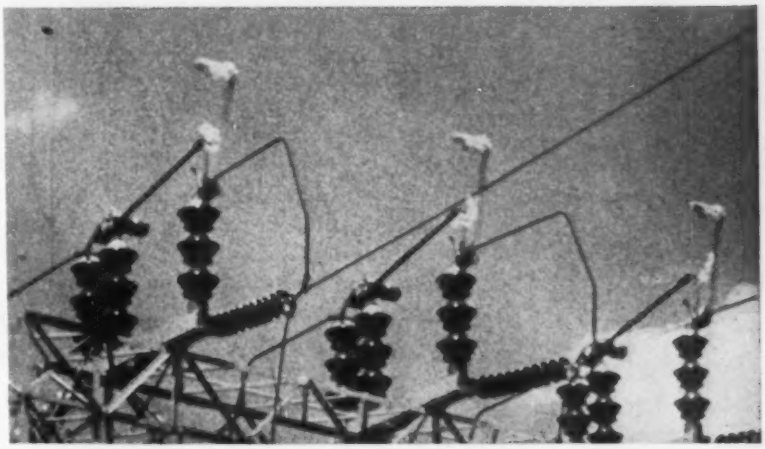
Because of infrequency of transformer failures, it is quite often possible to derive more benefit from the installation of a 110-kv oil circuit breaker than the mere protection of a single transformer bank. Under these conditions air switches equipped with special devices can be used to switch in or out of service individual 110/12—or 110/60-kv transformer banks.

PG and E has several large single bank 110/12-kv stations where facilities are needed to hot switch the spare transformer in service. Some arcing occurs when the existing horn gap type of 110-kv air switches are opened to break the parallels between the transformer windings. If the horn-gap type of switches were replaced with 110-kv air switch interrupter combinations, the entire operation would be arc free.

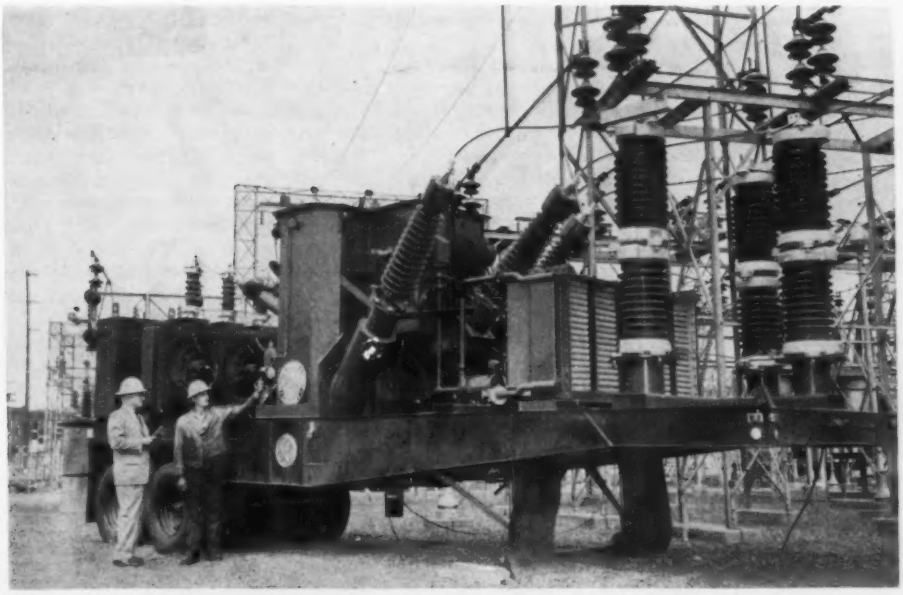
There are a number of tap stations supplied from 110-kv transmission lines which have sectionalizing air switches on both sides of the taps. In order to clear sections of transmission lines for maintenance these sectionalizing air switches can be equipped with special devices to prevent interruptions of service to the tap stations. Sometimes these tap stations have isolated distribution systems and then the devices for hot switching of the lines become especially beneficial.

Each application of one of the special switch and device combinations represents valuable savings, improved service or both.





Motion pictures taken during tests enabled engineers to carefully analyze results. Above, two sequential photos of switch dropping 25 miles of 110 kv line



This mobile transformer, built by General Electric to Pacific Power & Light Co.'s specifications, is one of two placed in service by PP&L for rapid dispatching for use in place of regular transformers when necessary to take out of service for maintenance or in emergencies. Designed to operate on Oregon and Washington highways without special permit, the trailer is 8 ft wide, 12½ ft high and 30½ ft long; weighs 50,000 lb. It can roll at 40 miles an hour. It can step down either 69 or 115 kv to 4,160, 12,450 or 20,800 v

Special secondary boxes were designed

Pad-mounted transformers were used. In background, houses take shape

Copco's first residential underground is . . .

DESIGNED TO USE PLASTIC CONDUIT

W. W. BRAWN, ELECTRICAL ENGINEER, CALIFORNIA OREGON POWER CO.

A new residential subdivision with underground utilities is being installed in the city of Medford. This is The California Oregon Power Co.'s first experience with residential underground distribution.

Being new afforded the opportunity to build a system taking the best from many published designs. In so doing, a cost in excess of overhead of $201 per lot was achieved. Equally interesting is that by improving on the first efforts even lower cost projects are in prospect.

The System

The overhead circuits adjacent to the subdivision are four wire, 12,470 v. The underground circuits into the subdivision are single phase, 7,200 v. The 2BC copper neutral is common to both primary and secondary and is buried directly in the ground. The hot leg is No. 2 copper, high molecular weight polyethylene, 15 kv, shielded cable. The polyethylene cable was chosen because of the lower cost. All indoor terminations were taped. A pothead was used at the termination between the overhead and underground. A 9-kv expulsion lightning arrester was installed at the pothead to protect the cable.

Rigid conduit was used to bring the cable down the pole. All primary and secondary cables underground were installed in 2-in. plastic conduit to facilitate replacement in case of cable insulation failure. The plastic conduit was covered with approximately 2 in. of concrete to prevent homeowners from digging into the conduit.

The transformers used were pad mounted with secondary breakers. Because of the wide 30-in. ditch, the transformer pads were extended down to the bottom of the ditch to secure solid footing. The transformers' secondary lugs were extended with bus bar to accommodate the many services and secondary.

Consideration was given to making secondary splice boxes with terminations completely underground by standing a tile on end underground. The idea was discarded because of the problem of keeping water out of the terminations and the difficulty of disconnecting. A galvanized steel box was designed to mount on a concrete pad so that all terminations would be above ground. The secondaries and services are bolted to bus bars mounted on inverted dead-end insulators. Since these boxes were purchased pedestals have become available at much less cost and do not require a concrete pad. In the next unit, these splice pedestals will be used. A 5/8 in. x 8 ft copperweld ground rod was driven at each transformer and secondary splice box and tied to the cases as well as the common neutral as additional protection from shock to the property owners.

The subdivider provided a 10-ft utility easement along the rear property lines. The telephone company chose not to occupy a common ditch and dug a separate ditch down the opposite side of the utility easement. The ditch was dug and backfilled by contract at 62½¢ per foot. The con-

tract called for a ditch 22 in. wide and 30 in. deep. The mechanical ditcher could not dig less than a 30-in. width. The wide ditch later proved to be a handicap because of the possibility of the transformer pads settling in the disturbed ground.

The customer is required to bring his underground service to the splice box or transformer. The watt-hour meter is mounted on the customer's house.

Some Overhead Secondaries

The lots adjacent to existing overhead circuits are fed from pole-mounted transformers. The secondaries were strung overhead to telephone poles, thence down the pole in conduit to the underground splice boxes. This was done, rather than run underground primary cable and install pad-mounted transformers, to minimize the cost of this installation.

In accordance with the published extension policy of the company, the subdivider was required to advance the total estimated cost of the underground installation. He will be refunded a certain amount of money, depending on the connected load of the lot purchaser. The total refunds will not exceed the estimated cost of an overhead distribution system to serve the subdivision. Thus the subdivider will pay the difference between the estimated cost of the underground system and an overhead system. The 80x140-ft lots are selling for $2,850 to $3,450, depending on the location. The first unit was composed of 46 lots; however, the complete subdivision will have 215 lots.

Construction Changes

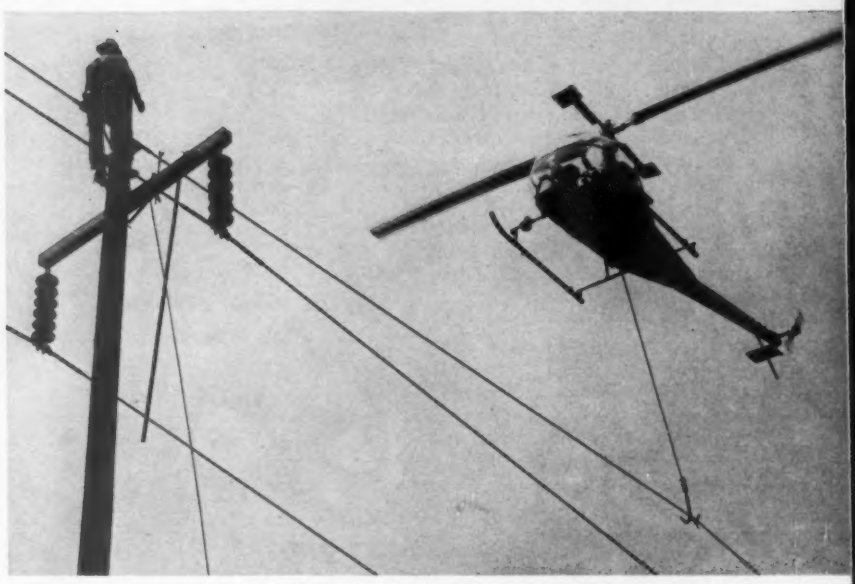
No trouble has been encountered since the Unit I installation was completed last summer. When Unit II is started, the following changes will be made in the construction: (1) The ditch will be only 8 in. wide; (2) the transformer pads will be precast concrete; (3) secondary pedestals will be used instead of secondary splice boxes; (4) the plastic conduit will be 2-in. plastic water pipe, which comes in 100-ft lengths. This will eliminate the numerous splices and problems of trying to make the splices watertight; there is a possibility that we will not cover the plastic conduit with concrete, except under streets. These changes will reduce the cost considerably.

There has been considerable public interest in this underground utilities subdivision.

Underground Cost Breakdown

2,376-ft trench, backfill and concrete over conduit (contract)	$ 1,510
2,705-ft 2-in. plastic conduit and elbows	904
1,514-ft No. 2, 15-kv polyethylene cable (incl. termination kits)	1,392
3,445-ft 600-v cable	1,095
22 Secondary splice boxes	539
12½ yd concrete (excluding that provided by ditch contractor)	256
Miscellaneous	3,629
Total material	9,325
Total labor	4,275
Transportation and overheads	2,765
Total material, labor, transportation and overheads	16,365
1 37½-kva, 3 50-kva and 1 75-kva pad mounted transformers (including installation cost)	4,896
46 Watt-hour meters (including installation cost)	1,068
Total cost	$22,329
Estimated cost if fed from overhead system	13,082
Difference	$ 9,247

Excess cost per lot = $9,247/46 lots = $201/lot



Above—Copter hooks line and lifts it off of 57-kv insulator. Left—Bringing in the new insulator and placing it on the pole top was facilitated by a trailing line, which lineman grabbed to guide insulator on to top of post

HELICOPTER TRIMS COSTS ON REINSULATION JOB

W. P. CUNNINGHAM, DIVISION LINE FOREMAN, GRESHAM DIVISION, PORTLAND GENERAL ELECTRIC CO.

After the pole top insulators had been replaced, helicopter lifts line into position for final clamping

The use of a helicopter enabled four linemen and four groundmen to perform a job of reinsulating in one day that would normally require a five-man crew seven days to accomplish.

The job consisted of reinsulating a 57-kv line for 115 kv. The line was located along a railroad right-of-way where it was impossible to get trucks and equipment.

Additionally, the job involved only replacing the pole top insulator because the original installation included 115-kv insulators on the outside of the crossarm. The normal procedure would involve rigging a gin pole to handle the 795 mcm ACSR conductor and to raise the 115-kv insulator—weighing about 200 lb.

Procedure

Only one lineman was required because there were no other circuits on the pole. When the lineman got up the pole, he removed the conductor clamp from the insulator. The copter then flew in with a rubber covered, three-pronged grappling hook, hooked the conductor from about 40 ft above the pole, lifted it off the insulator and laid it on the crossarm. While the lineman removed the 57-kv insulator, the copter returned to the supply area to pick up the new insulator. A trailing line, about 20 ft long, was attached to the new insulator. As the insulator approached the pole top, the lineman would grab the trailing line and pull it into position. The helicopter continued to hold the insulator until the lineman got one bolt in place. Then the lineman unhooked the rope sling, which supported the insulator from the grappling hook. Then the process was repeated on the next pole. After setting the insulator on the next pole, the craft returned to heft the conductor onto the new insulator.

There were 29 poles along 2½ miles completed during six hours of helicopter flying time.

ELECTRICAL WEST
Construction News

For
- contractors
- consulting engineers
- lighting engineers
- wiring designers
- distributor salesmen
- all interested

OSCAR G. HARBAK, vice-president, District 9 of IBEW, for 13 years, died of heart failure in Portland, June 19, while on a business trip for the Brotherhood. Originally a lineman in Washington, he had been active in union affairs most of his 61 years, serving as international vice-president from San Francisco for the district comprising California, Oregon, Nevada, Washington and Alaska for the past 13 years. Always a moderate, he appeared to take a broad industry viewpoint and worked for harmony and understanding rather than force.

SAFETY ORDERS of the California Division of Industrial Safety are being revised and committee hearings held in Los Angeles May 23-24 and San Francisco June 2-3 heard proposed revisions. Additional hearings are scheduled to cover parts not previously covered at San Francisco on July 14-15 and Los Angeles July 18-19. The Safety Orders apply to all electrical installation in places of employment and override all local codes in such occupancies.

OREGON has adopted the 1959 edition of the National Electrical Code as its basic state code after public hearings June 9 conducted by Norman Neilsen, commissioner of labor, and William Volheye, state electrical inspector. The effective date is Sept. 1 when it becomes law under the new administrative procedure act. The previous state code was declared unconstitutional after a court case.

PORTLAND'S CODE revisions, approved by ordinance May 12, become effective July 1, according to Joe Gray, chief electrical inspector. Among its changes are requirements to submit plans in advance for code checking on major work and for residences whose connected load exceeds 200 amp. Limits on circuit breaker use of double-pole units in service equipment fixtures, maximum of 3-kw heaters, including baseboard types, in dwellings are among other features.

FINAL DATE for receipt of proposals from the public for changes in the 1962 edition of the National Electrical Code has been announced as Dec. 1, 1960. The thorough processing through code panels, reviews by inspectors' associations and other interested groups and correlating committee require the time up to publication date of September 1962.

NEW ASSISTANT chapter manager to be resident in and serve the southern Oregon area for the Oregon-Columbia Chapter of NECA has been appointed, according to Bob Burns, manager. He is Carl Sorenson, a former business manager of IBEW Local 280. Office for this Cascade Division is 115 E. 11th St., Eugene. . . Negotiations have begun between Local 280 and

the NECA chapter on a new contract. The current one expires Aug. 1.

NEGOTIATIONS were also being conducted for the Bellingham area between Local 1032 and Puget Sound Chapter, NECA, the union asking a 15¢ increase. Both sides have asked for other changes in the agreement. . . In its new contract with Local 40 in Seattle NECA now has a shift work clause to enable contractors to get remodeling work outside daytime business hours without working a day shift.

SELF-APPRAISAL WORKSHOPS have appealed to a growing number of contractors in the West following the sample given at the May district conference of NECA in Phoenix and Seattle. Oregon-Columbia Chapter has some scheduled for Sept. 8-9 in Portland and Sept. 12-13 in the Cascade division. This chapter also plans an intensive estimating course in the fall in Portland. . . San Francisco Chapter held a very well-attended course on June 14-15 with attendance of 28. Others are being planned in many chapters.

ANOTHER FORM OF APPRAISAL is being undertaken by the Puget Sound Chapter. Its manager, Maynard Sundt, is courageously visiting the dens of all of the area's electrical engineers to get their candid opinions of contractors and how well they meet the specifications of being well "qualified".

ELECTRICAL CONSULTING ENGINEERS in California are seeking legislation regulating the practice of plan and design making by unregistered persons. Contractors have been a bit fearful the bill would outlaw their engineering of simple jobs they customarily have done. A compromise is being sought through the NECA public relations committee.

BID DEPOSITORIES are under attack by the California attorney-general's office particularly as applied to public works and legislation may be introduced to prohibit the use of bid depositories on such jobs. A letter, urging district attorneys of all counties to write in contract clauses forbidding bid depository filing and fees, has been sent out.

DISTRICT 6 ACTIONS—At the Tri-District meeting in Seattle District 6, in addition to reports on various national committees, discussed a bill being sponsored by the Eastern Washington and the Puget Sound Chapters before the Washington legislature calling for segregated bidding on all work and another bill to call for contracting out of all maintenance, repair, alteration and construction on state work. Other topics were the asking for supervising electrical licenses similar to those in Oregon and a contractor's licensing law like California's.

HOME SHOWS—First of the Snake River Valley Electrical Assn.'s home shows was held by the Magic Valley Chapter at Twin Falls High School gymnasium June 16-19. Feature was to be a total electric Gold Medallion Home already under construction, which was moved to the gymnasium. It again featured the X-ray idea and showed heating by cable, baseboard and insert.

To Lease or Buy? . . . Sample Leasing Transactions

Faced with the question of whether to buy, lease or purchase on installment necessary line construction equipment, the electrical contractor sometimes does not have a guide to his decision. At the Line Constructors session of the Tri-District, NECA, conference in Seattle, Gerald A. Petersen of Petersen Engineering Co., presented the following analysis. It is based on a hypothetical contractor with current assets of $175,000 and current liabilities of $100,000 at a consequent ratio of 1.75 to 1 who is in need of some $35,000 worth of equipment. The tables below show sample leasing transactions and the cost to the contractor of each.

Case I

Example: Customer desires to lease equipment costing $35,000, including sales tax and freight for four years (base period) for an indefinite number of annual renewals or with option to purchase:	
Initial equipment cost (including sales tax and freight)	$35,000.00
Lease term	4 years
Rate factor (rent per $1,000 of initial equipment cost per month)	$ 25.40
Deposit, last four months rent, payable in advance	3,556.00
Monthly rental, balance 44 months	889.00
Annual renewal rent: After base period (4 years), annual rent is payable in advance for each year. Annual rent per renewal year is 3½% of initial equipment cost	1,225.00
Purchase option (if requested by lessee): After base period (4 years), 12½% of initial equipment cost	4,375.00
After 4 annual renewals after base period (8 years total), 6¼% of initial equipment cost	2,187.50
Total cost of equipment	42,672.00

Case II

Example: Same as in case I except that the leasing company will always have complete ownership of the equipment and there will be no option-to-purchase clause:	
Invoice cost (including sales tax and freight)	$35,000.00
Lease term	4 years
Fourth year's rent in advance: 10%	$ 3,500.00
36 monthly rental payments	1,060.50
Annual rent, fifth and succeeding years	350.00
Total cost of equipment	41,678.00

Hypothetical Case of Lease Arrangement

The figures below show a hypothetical case of a contractor who can rent equipment without strain but would be severely strained financially if he bought the same equipment.

Financial Status

CASH OUTLAY FOR EQUIPMENT

Current assets	$175,000
Current liabilities	100,000
Ratio	1.75 to 1
Purchase $35,000 worth of equipment, paying cash:	
Current assets	$140,000
Current liabilities	100,000
Ratio	1.4 to 1

CONCLUSION: A current asset-liability ratio of less than 1.5 to 1 is not in good standing to borrow money from the bank to conduct operations.

FUNDS BORROWED FROM THE BANK

Current assets	$175,000
Current liabilities	100,000
Ratio	1.75 to 1
After borrowing $35,000 from the bank for equipment:	
Current assets	$175,000
Current liabilities	135,000
Ratio	1.29 to 1

CONCLUSION: Still unable to borrow money to conduct operations.

LEASE ARRANGEMENT

	Before	After
Current assets	$175,000	$175,000
Current liabilities	100,000	110,668
Ratio	1.75 to 1	1.58 to 1

After lease arrangement, setting up first year's payment as current liabilities as in good account procedure.

CONCLUSION: As you can see, the contractor is in good standing to borrow money from the bank to conduct his operations efficiently.

Plastic Washer

For expeditious maintenance of luminous ceilings of plastic panels or of lighting installations with a large number of plastic diffusing covers, an ingenious portable washer has been developed by Lease-Lite Corp., San Francisco, to handle its lighting maintenance contracts. Made of stainless steel in all parts coming in contact with the plastic to prevent marking, the compact unit is fed the plastic panels at one end, rinses, washes with detergent, scrubs with adjustable brushes and rinses off the detergent, and ejects the panels at the other drain dry without static build-up. The whole device is designed to go through an ordinary door, be carried in an elevator and be supplied water and drainage by its own hoses. With a slight change even corrugated plastic can be fed and cleaned through it.

DISCONNECT REQUIREMENTS AT REMOTE MOTORS

TOM HUGHES, ELECTRICAL SAFETY ENGINEER, CALIFORNIA DIVISION OF INDUSTRIAL SAFETY

Motors and Controls—XIII

It is the intent of electrical codes that somewhere along the line there shall be a disconnecting means by which any motor-driven equipment may be isolated from its electrical supply for maintenance and repairs. Since, as we have mentioned before, there are countless ways in which motors may be applied, it is difficult to set up any perfectly correlated rules.

In some cases, with small motors, the attachment plug on its supply cord is both the starter and the disconnect. In some other cases, more than one fixed motor (with permanent wiring in metal raceway) may be supplied from one branch circuit. But, in the normal setup, each motor is supplied from its own branch circuit, which originates at a fused switch or circuit breaker.

The intent of the California Electrical Safety Orders is to require that a maintenance man or operator shall have a means of disconnecting the motor leads or branch circuit and then (if he desires) placing a padlock on the disconnect so that no other person can in any way energize those leads. However, these safety orders get the user involved in mental gymnastics about the starter being out of sight of the disconnect and the motor being out of sight of the starter, etc.

We must realize that most of the ESO and NECODE articles on motor applications have been carried forward from the time when remote control setups were a new thing. The starter, in those days, was a manual piece of equipment with contacts that burned and had to be frequently maintained. So the code makers were concerned with the safety of the maintenance man working on the starter. The manual starter was always in sight of the motor or machinery to be controlled.

Today, the picture has changed. The controller (magnetic contactor) is no longer the initiating device and may be miles from the motor (whose supply current it controls). The real actuating device is a remote push-button station (maybe one of a series string of stations), pressure switch, time clock, float switch, etc., and may not be in sight of the motor.

So, the real intent of the ESO is that the branch circuit disconnect must have means provided for locking it in the open position unless it is in sight of and reasonably close proximity to its motor; or there is an additional disconnect at the motor. The ESO provides that this disconnect at the motor may be in the control circuit but this is a risky setup.

Over a period of a few years we have had two fatal accidents and one man badly mangled from working inside concrete mixers without the branch circuit de-energized. In one case the start button (mounted on the frame of the mixer) was defective The jar of hammering on the mixer to break loose accumulated concrete caused this button to make momentary contact and start the mixer.

Recalling our previous discussion on the hazards produced by fault grounds at some point in the control circuit wiring, we can see that opening the actual motor leads is the only foolproof means of deactivating the motor.

Where the starter is of the so-called manual type and its stop button or actuating lever can be locked in the open position, it can serve as the means of locking out the circuit (when fed from a branch circuit protected by a molded case circuit breaker). On the other hand, it may serve as the remote disconnect at the motor when it is mounted near the motor. By manual type we mean that it directly opens the motor leads and is not of the magnetic or remote-control type. We call attention to this because, as previously stated, a push-button station in the control circuit could be construed as a manual starter.

Usually, however, for this remote disconnect at the motor location, the practice is to insert a three-pole, nonfused, disconnect switch in the motor leads. While this is the most foolproof setup, from the standpoint of preventing accidental energizing of the motor by unexpected malfunctioning of the control circuit, it does present another possible hazard.

Mixups in Procedure

This disconnect is used to open the motor leads on the load side of the controller. While it is open and work is being done on the motor or its driven machinery, someone may throw the starter (if of the manual type) into its running position. When he finds the remote motor doesn't run he doesn't think to open the starter. Or someone may push a start button at a remote push-button station, causing the magnetic controller to pull in to running position and stay there; or a pressure switch may close the starter as pressure drops, etc.

At the motor (out of sight of the starter) the persons working on the equipment are not aware of this unsuccessful try at starting the motor. When they are ready to try out the repaired equipment or exchanged motor, they close the disconnect switch (expecting to control the starting by an adjacent push-button station). The motor starts up before they are ready and may injure someone or damage the machinery before it can be stopped.

This is also another example of emergency in which a disconnect may be opened in desperation and possible switch explosion result from opening under load or stalled rotor condition. It shows that such a disconnect must be a motor-rated type like the branch circuit switch.

So, all these factors must be considered in choosing the most suitable equipment for a particular location or type of operation. At the same time, maintenance men must establish a procedure for safely controlling such situations as they reactivate a down machine. Whether at work, at home, or in a modern automobile, we are moving in a complex age and the way is fraught with such booby traps today.

But, getting back to this matter of using a group of molded case circuit breakers in a motor distribution panel. They must meet the same requirements as a fused switch and so means must be provided for locking them in the open position when not in sight of the motor. When they are placed in a metal panel without being recessed behind a door, some manufacturers turn up ears in the sheet metal surrounding the hole for protrusion of the handle. The ears have holes for inserting a padlock to secure the handle in the open position (or closed position if desired).

Some manufacturers make no attempt to provide this lockout means regardless of how the circuit break-

ers are mounted. When sheet metal surrounds the handle it is not difficult for the user to attach his own angle clips for locking but, when the molded case breakers are mounted behind a door with only Bakelite adjoining the handle, it is difficult to devise such means.

It is up to the manufacturer of the panel to provide factory-made metal clips in such a position that a padlock can be used effectively to deactivate the breaker handle. But most of the manufacturers are not attaching such devices unless the buyer orders them.

This means that inspectors must turn down the job in the field and the user is forced to go through the involved mess of ordering them from the factory and having to supply the factory with proper identification of the specific breakers for which they are required, as different size or type breakers require different devices. If the devices were attached at the factory, it would involve only a small fraction of the cost involved when they must be secured and attached in the field.

Rig can be wheeled like a wheelbarrow wherever needed

Heavy-duty electric drill is used for power for the winch

From his field experience . . .

VERSATILE CABLE PULLER DEVELOPED

From his own long years as an electrician faced with the need to set up equipment for pulling heavy cables through conduit, M. E. Jones, member of IBEW Local 595, Berkeley, has developed a versatile tool that is finding favor among contractors in the Bay area. Illustrated here, it is used on pulling some heavy feeders at an industrial plant in Berkeley by Charles B. Farrow Co., contractor. In this case it pulled three 4/0 conductors of varnished cambric and lead in a single cable 170 ft and through two 90° bends. The outside diameter of the cable was 2 in. and it was being pulled in a 3-in. conduit.

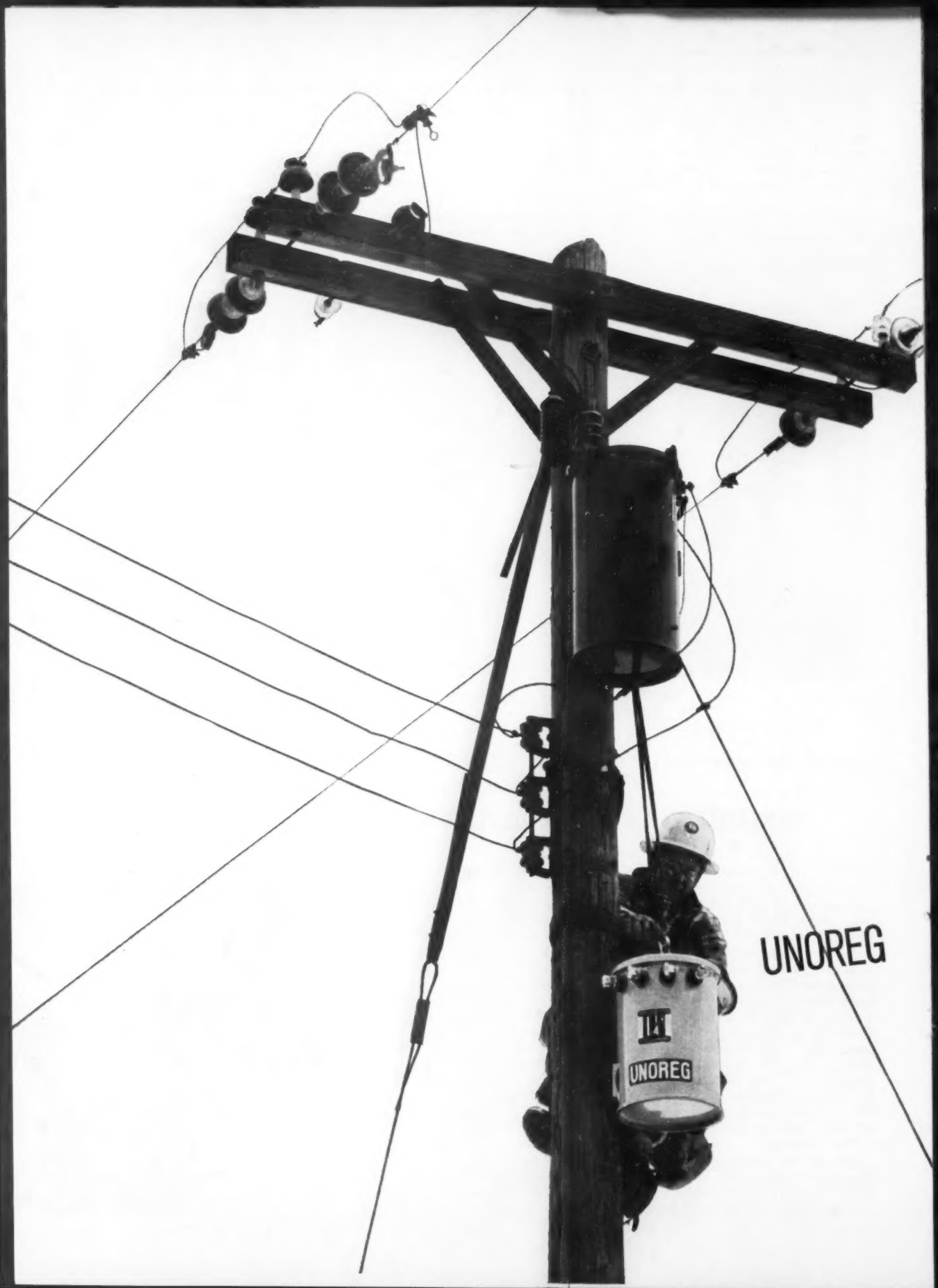
The device consists of an A-frame constructed of heavy conduit to which a winch and gearing are attached. At the top of the A-frame is a pulley. Ingeniously this pulley acts like the wheel of a wheelbarrow to transport the rig from place to place on the job. Handles are provided at the base of the A-frame which, when not in use, go into the conduit.

Gear ratios are provided in the winch assembly to give either a 4-to-1 gear reduction or, for extreme cases, 24 to 1. Different pinions and parts are supplied for the changeover.

The winch is operated either by a 300-rpm electric drill or a pipe mule. The winch will carry 425 ft of 3/8-in. steel wire rope.

The rig is adjustable to various pulling conditions by bolting the conduit clamp to the incoming conduit and by positioning a pulley that can be slid to any position. Thus, horizontal, vertical or any other position pulls can be accommodated.

Jones, the inventor, adjusts movable pulley on stiffening arm for a straight cable pull. End clamp protects conduit bushing as well as bracing the rig


UNOREG
UNOREG

BY ANY COMPARISON, WESTINGHOUSE EXCLUSIVE DISTRIBUTION VOLTAGE REGULATOR CUTS COSTS . . . REDUCES INVENTORY . . . STEPS UP SYSTEM PERFORMANCE. Far and away the greatest area of savings to you is in the initial cost of equipment . . . up to 66% in savings in capital investment alone. A relatively few Unoregs,* at $150 each in the 1¼-kva size, replace bulky banks of conventional line regulators at many thousands of dollars. A wholly new Westinghouse concept of voltage regulation has now made possible total savings of millions of dollars annually for the nation's electric utilities. These outstanding economies have already been proved on some utility systems.

Because of its small size (21½" high, 12¼" in diameter), Unoreg is whisked up the pole in record time, installs easily on the secondary side of the transformer. And just as easily, it can be moved to other locations for emergencies, spot loads or changing line conditions, without disturbing a single transformer. Unoreg doesn't even have to be installed on the same pole with the transformer. This is a virtual impossibility with either the usual cumbersome regulators or with combination transformer-regulator equipment. Here is ease of handling and flexibility of application you can readily translate into thousands of dollars saved, as you use Unoreg.

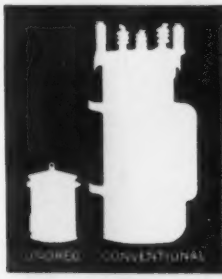
No matter where it is, Unoreg can save you money. In stocking, for example, just one model, the 1¼, covers over 400 styles of distribution transformers. This tremendous flexibility is at your command because Unoreg is separate from the transformer, representing savings in inventory of both regulators and transformers.

Unoreg is a truly install-and-forget-it device. Unoreg is a plus or minus 5% buck and boost regulator. It will automatically change from one service to the other. Unoreg is an induction regulator, and its voltage control a static relay . . . both inherently trouble-free. J-70947

*Trade-Mark

STARTS SAVING YOU MONEY ON THE WAY UP THE POLE

Compare Unoreg with any regulating device. Unoreg provides the very best, most economical reregulation available. Check out these "pluses"—



COMPARE!

Chart	First Cost	Installation	Flexibility	Stocking
Unoreg	+	+	+	+
Conventional Line Regulators	–	–	–	–
Tap Changing Under Load Transformers	–	–	–	–

YOU CAN BE SURE...IF IT'S **Westinghouse**

TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

For phone number of closest representative see advertising index in back of book.

Associations

(Continued from page 63)

Andy Anderson of Phoenix wins first award, Class I, at Scottsdale conference

Walt Perram and Bill Downey of Phoenix receive first award for joint entry in Applied Lighting contest from President Joe Browder of IES

Applied Lighting contestants at IES Hollywood conference. Back row: M. G. Talbott, Robert Claghorn, Gail Anderson, Rudy Dew. Front row: Bruce Thyberg, Norman Tyler, R. L. Sawyier and Elton Harris. Sawyier was proxy for Haskell, McMath and Dresser

APPLIED LIGHTING CONTESTANTS PLAY-OFF

The Applied Lighting Contest, formerly known as the "My Most Interesting Lighting Job" Contest, conducted first by the chapters and sections and then at each of the three regional conferences of the Illuminating Engineering Society in the West, last month, often proves the highlight of the conventions. Here the practical application of the principles advocated by the society are reviewed and those judged the best go on to be judged in a national contest at the annual technical conference, which will be in Pittsburgh in September.

Winners of the two contests, one for residential, the other commercial and industrial, at the Intermountain region convention at Scottsdale, were: Residential, Class I. First prize: Bill Downey and Walter Perram of the Arizona Section. Second prize: Mary Douglas, Southern Colorado Chapter, Pueblo. Third prize: Greg Cloos, Rocky Mountain Section, Denver, presented by proxy Harold Rankin.

Class II, Commercial-Industrial. First prize: Andrew Anderson, Arizona Section, Phoenix. Second prize: Vernon Proctor, Utah Chapter. Third prize: William Peach, Southern Colorado Chapter, Pueblo.

In the South Pacific Coast region conference the winners in the Class I, Residential, were: Robert Haskell, PG and E, Golden Gate Section, presented by R. L. Sawyier by proxy. Second prize: Irwin McMath, Yosemite Chapter, also presented by proxy Sawyier. Third prize: William Brillsour, Diablo Section, Oakland, presented by proxy by N. G. Talbott.

In the Class II, Commercial and Industrial, Bruce Thyberg, California Electric Works, San Diego Section, won first prize. Second prize: Ray Dresser, Yosemite Chapter, presented by Sawyier as proxy. Third prize: M. G. Talbott, Diablo Section, presented by himself.

Winners both in the Diablo Section, IES, Applied Lighting contest, and of both third prizes at the regional conference were Bill Brillsour and M. G. Talbott. Grant Radford, section chairman, presents the award

Regional vice-president-elect Jack Cottingham, Portland, won first award in the Applied Lighting Class 1 contest, received a certificate from vice-president Beverly Travis

Gordon Buzan, electrical consultant, Vancouver, receives first prize in commercial contest from Beverly Travis

Other contestants in the regional contest were Rex Gardiner, San Jose Chapter; Robert Claghorn, Mother Lode Section; Thomas Riddle, Mother Lode Section; Norman Tyler, Southern California Section; Elton Harris, Mother Lode Section, Sacramento; Norman Tylor, Southern California Section; Gail Anderson, Arrowhead Chapter, San Bernardino; Rudy Dew, Arrowhead Chapter, San Bernardino; Woodrow Ratner, San Diego Section.

At the Pacific Northwest regional conference the winners in Class I, Residential, were: Jack T. Cottingham, Portland General Electric Co., Oregon Section, first prize; second prize: Miss Dorothy McGregor, B. C. Electric Co., B. C. Section; third prize: E. A. Matlock, Puget Sound Power & Light, Puget Sound Section.

In Class II, Commercial, Gordon Buzan, Vancouver, B. C. Section, won first prize; James H. Skog, Puget Sound Section, second prize; and J. B. Bradshaw, Edmonton Section, third prize.

Other contestants at this conference were: Kurt O. Sorenson, Edmonton Chapter, and R. W. Underhill, Chinook Chapter.

► **Norman Dean** has been named director of labor relations and apprenticeship by the Los Angeles Chapter of National Electrical Contractors Assn. Most recently he has been business manager for the IBEW locals at Grand Junction, Colo., and more recently Cheyenne, Wyo. He has been with the industry for some 20 years.

► **W. Robert Moody,** electrical engineer for Utah Power & Light Co., has been elected president of the Utah Section, AIEE, succeeding F. Cyrus Bates. Other new officers for 1960-61 are: C. Robert Lufkin, General Electric, vice-president, and Nelse Jones, Westinghouse Electric, secretary-treasurer.

People

Gardner Named Board Chairman

Reid Gardner, president and general manager of Southern Nevada Power Co., has been named to the newly created post of chairman of the board of directors. He will continue to serve as president and general manager.

In other action at its annual meeting the company's board of directors re-elected Cyril S. Wengert as vice-president and secretary of the company, and C. L. Ronnow as vice-president. Elmer F. Johnson, vice-president, was named assistant general manager and Arthur E. Pearson, treasurer, was elected a vice-president. Harry Allen, former executive assistant, was also elected a vice-president.

► **Lawrence L. Gann,** commercial manager of Colorado Central Power Co., was elected assistant secretary and assistant treasurer. He joined the company in 1934 as appliance salesman at Fort Lupton and was made commercial manager in November 1947. He will continue as commercial manager in addition to his new duties.

Gann

► **W. Denis Kennedy** has been appointed chief advisor on economic and commercial matters for B. C. Power Commission. A former director of the Vancouver consulting firm of Crippen-Wright Engineering Ltd., he helped prepare the economic aspect of that company's report on Columbia River development. He was assistant chief commercial officer of the Eastern Electricity Board of Great Britain before joining Crippen-Wright.

► Salt River Project has announced promotions in its Development & Sales Department. **Don G. Parlett,** who has been associated with the project since 1953, was made assistant sales manager and supervisor of area development. **Clayton L. Holm,** with the department since 1957, was made supervisor of residential sales. **Gary Harrison** and **Berle Moore** are now commercial power consultants. New men in the department include **Charles K. Marshall,** supervisor of commercial and industrial sales, and **Richard N. Ruecker,** dealer sales consultant.

► **Erick A. Benson** has been named deputy power supervisor at Grand Coulee. Formerly an engineer with the Corps of Engineers, he has been manager of the bureau's Parker-Davis project for the past six years.

Cheyenne LF&P Changes

Transfer and promotion of several key personnel has been announced by Cheyenne Light, Fuel & Power Co.

L. J. Weber, superintendent, will leave the company and assume the superintendent's position with the Boulder division of Public Service Co. of Colorado, Cheyenne's parent firm.

G. R. "Bud" Peel, superintendent of the Sterling division of Public Service Co., will return to Cheyenne to replace Weber.

Kenneth B. Levengood, office manager of the Sterling division, will be transferred to Cheyenne, filling the vacancy caused by the death of W. J. Quinn.

Weber has been superintendent of the Cheyenne company since 1955. Peel has been Sterling superintendent since October 1957. He formerly was engineer supervisor of the company's electrical distribution division.

► **J. Harvey Leach,** Western division manager of the Puget Sound Power & Light Co., will retire Aug. 1, after 32 years with the company. He started on a construction crew while still a college student in 1913 and has been with the company since except for military service.

► **W. A. Mundy** has been made manager of electrical publications for Biddle Trade Publishing Co., Los Angeles, according to A. H. Gudie, president. Mundy has been West Coast manager for Appleton Electric Co., headquartered in Los Angeles.

► **Milton T. Sargent** has been made Eastern Division manager for Idaho Power Co. He succeeds **L. W. Brainard,** who has resigned after 41 years' service. Sargent, who has been with the company for 36 years, was named assistant manager last year.

More than 1800 fluorescent fixtures in Old American's new building help create this striking nighttime impression.

ARCHITECTS: Voscamp and Slezak
MECHANICAL ENGINEERS: Scott and Kinney

110 footcandles of glare-free illumination are maintained throughout, including this attractive lounge for employes.

How Old American Insurance Co. ended the great lighting search with Day-Brite

True to Missouri tradition, Old American Insurance Co. adopted a "Show Me" attitude when considering lighting for their new Kansas City headquarters.

Working closely with their architect and consulting engineer, they contacted their local power and light company engineers. Consulted the experts at General Electric's famed Nela Park. Even made their Addressograph Department a "lighting laboratory" and installed competitive fixtures side-by-side.

Result? For lighting effectiveness with high visual comfort, over-all economy with trouble-free maintenance, and pleasing appearance, Day-Brite lighting was the clear-cut choice.

May we show *you?* Call your Day-Brite representative, listed in the Yellow Pages, for the FACTS AND FIXTURES! *Day-Brite Lighting, Inc., St. Louis, Mo. and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

Modular design, incorporating Day-Brite Mobilex® with Cleartex® enclosures, permits complete flexibility in arranging offices and work areas.

DAY-BRITE

NATION'S LARGEST MANUFACTURER OF
COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

Sierra Pacific Appoints Executive Vice-President

Appointment of an executive vice-president and promotion of three department heads to the vice presidency has been announced by Sierra Pacific Power Co.

Fred L. Fletcher, formerly vice-president and general manager of the Lincoln Division of Central Illinois Electric & Gas Co., has been named executive vice-president of the Nevada utility.

Elected vice-presidents were Roy Torvinen, treasurer; Neil W. Plath, general superintendent; and Merle H. Atcheson, chief engineer.

Promotions at Arizona PS

Arizona Public Service Co. has announced promotions in its planning, resources and operations group.

Bridgwater

Malcolm M. Bridgwater, vice-president, has been appointed manager of the new Power Contracts & Scheduling Department. Max R. Llewellyn has been made manager of gas and electric operations, a post formerly held by Bridgwater.

George Carlin has been promoted to the post of manager of system overhead lines, and Kenneth Hood has been made manager of system electric equipment.

Hans L. Schunk, who has spent his entire career with General Electric in Los Angeles, completed a half century of service recently. He is shown, center, receiving his 50-year service pin from S. W. Scarfe, district manager of generation, transmission and auxiliary sales. Schunk, who is now in generation, transmission and auxiliary sales, started as an office boy on a bicycle

► **George F. Mackenzie,** for 47 years with Pacific Power & Light Co. and associated organizations, retired at the end of May. He started with Portland Gas & Coke Co. in 1913 and his assignments moved him back and forth between that company and PP&L until the two were separated.

Mackenzie

In 1947 he was named assistant secretary and assistant treasurer of PP&L and was made treasurer in 1950. He became vice-president and treasurer in 1957 and vice-president and controller in 1958. In 1959 he was elected to the board of directors. An amateur song writer and actor, Mackenzie has been in demand as a master of ceremonies at many electrical industry functions.

► **I. W. Borda,** vice-president and general sales manager of the Okonite Co., retired June 15 after 36 years of service. Until 1957, when he went to the company's Passaic, N.J., headquarters, Borda served on the West Coast. Starting as a sales representative in the San Francisco office in 1924, he was made Pacific Coast manager in 1928 and became a vice-president in 1929. He is a past president of PCEA.

► **Otto K. Mangum,** Bureau of Reclamation engineer, has been made project manager of the Parker-Davis project headquartered at Phoenix. He succeeds Erick Benson.

► **Robert Schultz,** electrical engineer for Pacific Power & Light Co. in Casper, Wyo., has been elected secretary-treasurer of the Wyoming Society of Professional Engineers.

► **Major John F. Kimbel,** executive officer of the Portland Army Engineers since last September, has been made deputy district engineer.

► **Ted S. Hoffman** has been made vice-president, industrial relations, for Hoffman Electronics Corp.

► **Eugene E. Jurs** has joined the Industrial Ladder Co. of Oakland as its president and general manager. He formerly was vice-president of Shand & Jurs of Berkeley.

► **Wayne Brown** has joined F. E. Bennett Co., 426 N. W. Sixth Ave., Portland. He was formerly with Portland Furniture Mfg. Co.

Here are the Graybar Offices in the West

ARIZONA

Phoenix:	1700 North 22nd Ave. ALpine 2-2371
Tucson:	212 South Park Ave. MAin 2-6439

CALIFORNIA

Bakersfield:	2828 "K" St. FAirview 4-4755
Fresno:	2626 Hamilton Ave. ADams 7-4175
Long Beach:	800 West 16th St. HEmlock 2-2911
Los Angeles:	210 Anderson St. ANgelus 3-7282
Oakland:	1911 Union St. GLencourt 1-5451
Oceanside:	805 N. Tremont St. SAratoga 2-2141
Sacramento:	1900 - 14th St. HIckory 4-8830
San Bernardino:	655 South "H" St. TUrner 9-1051
San Diego:	720 State St. BElmont 3-1361
San Jose:	1376 N. Tenth St. CYpress 2-9090
San Francisco:	1750 Alameda St. MArket 1-5131
Santa Ana:	301 French St. KImberly 3-8309
Santa Barbara:	329 S. Salinas St. WOodland 5-1013
Van Nuys:	15520 Cabrito Road STate 2-9600

COLORADO

Colorado Springs:	630 West Vermijo Ave. MElrose 4-3701
Denver:	104 Wazee Market TAbor 5-7111

IDAHO

Boise:	1325 Idaho St. BOise 3-2594

MONTANA

Butte:	604 E. Aluminum St. BUtte 3233

OREGON

Eugene:	2380 West Broadway DIamond 4-2224
Portland:	N.E. 60th and Banfield ATlantic 8-5661

UTAH

Salt Lake City:	336 North Third West St. ELgin 9-8771

WASHINGTON

Seattle:	King & Occidental Sts. MUtual 2-0123
Spokane:	West 1033 Gardner Ave. FAirfax 7-6611
Tacoma:	2112 "A" St. MArket 7-0164

FOR IMMEDIATE SERVICE ON EVERYTHING ELECTRICAL CALL THE OFFICE NEAREST YOU

You can save money on line maintenance with Graybar as your auxiliary warehouse

Need wire cutters? Pin type insulators? Guy strand? An electric impact wrench? Whether for day-to-day use or emergencies, Graybar can deliver everything you need for line maintenance — from eye bolts to completely pre-assembled fifty-foot double plank transmission crossarms.

Equally important, you can save money with Graybar as your auxiliary warehouse for maintenance materials. For one thing, you can cover your needs on a single Graybar transaction. You can save also on handling the materials. And you can lighten your maintenance inventory, because Graybar carries the most complete stocks of *any* electrical distributor.

Start with a local call . . . Have your Graybar man come in. He is familiar with your problems. He knows his stock thoroughly.

When Graybar is your auxiliary warehouse —	You save on storeroom costs Reduce inventory investment Insure prompt delivery Step up manhour efficiency Simplify bookkeeping

948

GraybaR

ELECTRIC COMPANY, INC.

Everything Electrical GraybaR ELECTRIC COMPANY

IN OVER 130 PRINCIPAL CITIES

NOW YOU CAN GET SAFER, FASTER, LONGER-LASTING

Anaconda Durasheath has a new clean-stripping, semi-conducting tape

The megohm meters (above) are measuring the surface resistivity on two samples of high-voltage, rubber-insulated, Shielded and Neoprene-jacketed cable immediately after the semi-conducting tape has been removed. The sample on the left (with a megohm meter reading in excess of 100 megohms) is Anaconda Durasheath incorporating the exclusive clean-stripping, semi-conducting tape. For comparison, the cable on the right with a low reading typifies old-style cable manufactured with ordinary semi-conducting tape.

The old-style cable requires tedious surface filing and buffing before it is clean of conducting particles, and ready for the tape build-up necessary to complete the splice or termination. Even after all these preparations, the surface may still be conducting because of the semi-conducting particles remaining deeply imbedded in the insulation.

New Anaconda Durasheath eliminates the need for excessive filing and buffing. Because the semi-con tape strips clean, the bared Durasheath insulation surface is left with only slight traces of easily

FASTEST WESTERN SERVICE—At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for every type

"Meggers"—courtesy James G. Biddle Co., Philadelphia, Pa.

JOINTS AND TERMINATIONS ON HIGH-VOLTAGE CABLE

removed semi-conducting particles. The meter readings will show that a moment of buffing is all that's needed to complete surface preparation for tape build-ups and the most reliable splice or termination possible today.

The planned research and production program which brings you this outstanding cable development is also responsible for the equally important developments in Butyl rubber insulation compounding, and extruding, which have produced the best possible balanced design and construction in high-voltage rubber-insulated cable obtainable today—Anaconda Durasheath.

For more details, write for Anaconda Bulletin DM-5903, covering Durasheath High-Voltage Cable and DMS-5566, 5720 & 5735 dealing with the splicing & terminating of Durasheath Cable. Contact your nearest Anaconda Wire & Cable Company District Office, or write to: 25 Broadway, New York 4, N. Y.

61238 Rev.

ASK THE MAN FROM

ANACONDA®

ABOUT DURASHEATH® CABLE

of application. Anaconda assures the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver.

► **Tom Long** of Portland General Electric Co.'s commercial department in Oregon City has been appointed to his sixth term as a member of the Clackamas County Housing Commission. He's an ex-postmaster, too. A 35-year man with PGE, he took a six-month leave in 1946-47 to serve an interim appointment as Oregon City postmaster.

Deaths

► **Leo Joseph "Jerry" Collins,** well known to the lighting industry of the Northwest and lately Portland General Electric Co.'s commercial sales manager, died May 3 after a lengthy illness of cancer. He had been with PGE since April 1923 and served as sales representative, sales engineer and sales supervisor. He was a past president of the Electric Club and the IES in Oregon.

► **Oscar Carlson,** 59, manager of the Lander, Wyo., office of Pacific Power & Light Co., died May 21 of a heart attack. Carlson had been employed by Pacific Power & Light Co. and its predecessor for 39 years. He had been manager of the Lander office for more than 30 years.

► **Parker R. Grimes,** 50, chief of the planning branch power section in the engineering division of the Walla Walla, Wash., district office of the Corps of Engineers, died May 16 at Walla Walla. He had been in charge of power studies for John Day Dam on the Columbia River and the Corps, four lower Snake dam projects. He joined the Walla Walla district staff in 1950 after service with several federal agencies, including the Federal Power Commission, San Francisco office.

► **George R. Strandberg,** retired consulting engineer of Stone & Webster Engineering Corp., died recently at the age of 71. He was graduated from the University of Washington in Seattle in 1911 with a bachelor's degree in civil engineering and joined Stone & Webster in 1912. He was active after retirement as consulting engineer to Puget Sound Power & Light Co. and Chelan County PUD.

► **Charles L. Ovard,** 51, died June 2 at his home of a heart ailment. He was assistant to the president and assistant secretary of Utah Power & Light Co. A graduate of University of Utah in law and business, he was for 30 years on the legal staff of the utility prior to being named assistant to the president last year.

Manufacturers—Distributors

Honn

Nodder

Honn Co. Incorporates

Geo. E. Honn Co., San Francisco manufacturer's representative, has announced a change in its organization from a partnership to a corporation effective May 1.

Started in 1934 by Geo. E. Honn, the organization became a partnership in 1938 with Honn and Roy Wilkins as partners. When Wilkins retired in 1939, it reverted to a sole proprietorship.

Under the new setup, Geo. E. Honn becomes chairman of the board.

W. R. Nodder, who is president of the corporation, joined the organization in 1946 and became a junior parner in 1952.

Other officers are: C. L. Winham, vice-president; J. D. Graham, vice-president; and V. M. Bell, secretary-treasurer.

The firm acts as sales representative for Burndy, Electrical Engineers Equipment Co., Kellems, Pennsylvania Transformer, States Co. and others.

► Opening of a San Francisco office of **H. Zinder & Associates,** consultants and engineers specializing in energy resources, has been announced by H. Zinder, president. **Sol Schultz,** partner and manager of the Seattle office, will be in charge of the new office located in the Mills Bldg. at 220 Montgomery St. The firm is now making a study for the State of California, a portion of which deals with the proposed power tie between California, Oregon and Washington.

Cutter Joins Schwager-Wood

Charles H. Cutter, well known in the electrical industry and for 37 years associated with Pacific Electric Mfg. and its successor, Federal Pacific Electric, has joined Schwager-Wood Co. of Portland as commercial vice-president. He had been in Seattle for a number of years as Northwest representative for Federal Pacific. Schwager-Wood headquarters are at 8024 S. W. 35th Ave. in Portland. According to Vice-president Max Wood, Cutter will push sales of the company's high voltage equipment, particularly in the West.

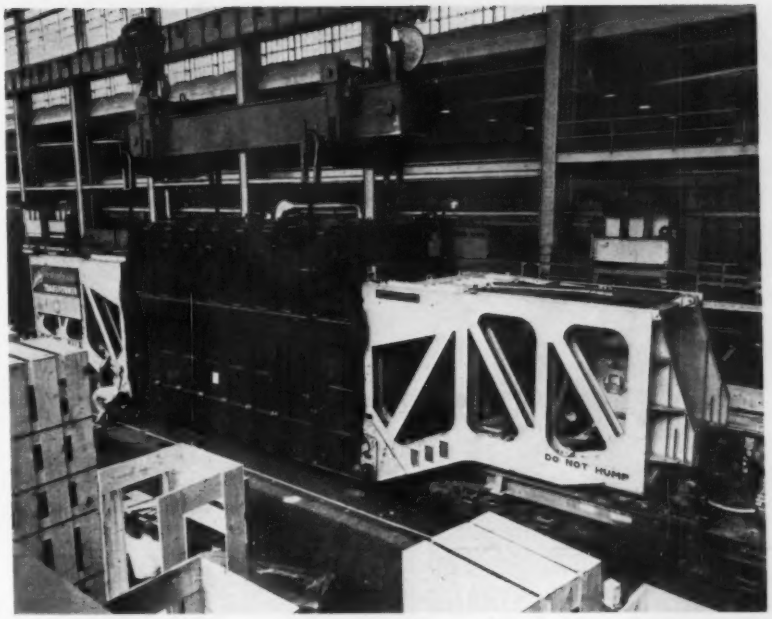
Cutter

A. B. Chance Co. has moved into its new northern California Servicenter at 1511 Adrian Road, Burlingame, Calif. Dwight Argo, Western regional manager, who will headquarter at the new facility, reports that the center will have double the warehouse capacity of Chance's previous location at 1815 Tennessee St. in San Francisco and larger and more efficient facilities for the assembly of switches and cutouts. The new warehouse plus arrangements for completing palletizing shipments will provide faster service to customers in northern California, Nevada and southern Oregon

Maechtlen Heads Square D

Lawrence G. Maechtlen, former Western Division manager, has been elected president of the Square D Co. by its board of directors. He joined Square D upon his graduation from California Institute of Technology in 1926 and in 1951 was elected a vice-president and director while continuing to head Western operations. He was transferred to Detroit as first vice-president in 1957, and was named to the newly created post of executive vice-president in October 1958. A native of Los Angeles and headquartered there as Western Division manager, Maechtlen is a former president of the Los Angeles Electric Club and a former director of the Pacific Coast Electrical Assn.

Maechtlen



A 230-ton three-phase transformer, largest to be shipped for the West by Westinghouse Electric Corp., is on its way to Southern California Edison's El Nido substation near Hawthorne, Calif. The transformer, built at the transformer division at Sharon, Pa., is starting on the longest trip undertaken in the Schnabel car, specially designed to carry giant transformers. This one weighs 465,000 lb. net and is 223 in. high

New Sales Offices for Kaiser Steel

Kaiser Steel Corp. has opened a sales office in Salt Lake City to handle sales in the greater Salt Lake area and throughout Utah and southern Idaho. David B. Brunson, who has been with Kaiser's sales organization since 1949, was transferred from Oakland to serve as Salt Lake City sales representative.

In a further expansion of field sales offices, Kaiser Steel has established an office in Albuquerque, N.M., with Keith W. Meserve in charge. The new office will be located at 336 Korber Bldg., Albuquerque, and will service New Mexico, west Texas and the Texas Panhandle.

► **Day-Brite** stockholders approved sales of company assets to **Emerson Electric** by a vote of 664,575 to 1,173. Basis of exchange will be .43 share of Emerson for each share of Day-Brite stock.

► **Dick Hausenberger,** inside salesman for **J. A. Tudor & Associates** in Portland, attended Allen-Bradley's sales school in Milwaukee during June.

► **S&C,** formerly represented in Portland by Andrew L. Polich Inc., has appointed its own factory man there. **Fred Allehoff** will handle the line from headquarters in 413 Weatherly Bldg., Portland 14.

► **Bethlehem Steel** Co. has moved its Pacific Coast Division general offices and its San Francisco District sales office to the Bethlehem Building, 100 California St., San Francisco. Mail address is Box 3494 Rincon Annex, San Francisco 19. Telephone: YUkon 1-2121.

Engineering Firm Formed at B. C.

A new consulting engineering company—Crippen Ruskin & Associates Engineering Ltd.—has been formed in Vancouver, B. C., with offices at 207 W. Hastings St. Glenn E. Crippen and Vernon W. Ruskin head the new firm which, with Crippen Wright Engineering Ltd., will offer an increased range of complementary services.

Ruskin recently resigned as director of planning for B. C. Engineering/IPEC, engineering consultant for B. C. Electric, and Crippen is president of Crippen Wright Engineering, which is now engaged in design and supervision of construction of the Squaw Rapids hydroelectric development in Saskatchewan, involving ultimate installation of 268,000 kw.

► **Kraloy Plastic Pipe** Co. has opened a general office and manufacturing facilities in Santa Ana, Calif. Address is 402 W. Central Ave.

► **Cecil R. Pickens** has been named insulated products sales manager for the Electrical Conductor Division of Kaiser Aluminum & Chemical Sales. In announcing the appointment, J. Carl Ferguson, division general sales manager, said that the position is a new one in the organization. Pickens was formerly division technical manager at the Newark, Ohio, wire and cable works. He joined Kaiser Aluminum in 1957, when the firm acquired the Wire & Cable Department of U. S. Rubber Co. His new headquarters will be at Kaiser Center in Oakland, Calif.

Pickens

► **J. A. Tudor & Associates** of Seattle and Portland is now Pacific Northwest representative for Automatic Timing & Controls Inc., King of Prussia, Pa.

► **Dr. Hans Jordan** has been promoted by Waste King Corp. of Los Angeles to the newly created position of vice-president-engineering counsel. Another new appointment at Waste King, **A. M. Anderson** has been made vice-president-appliance engineering.

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!

INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana

Eardley

Nelson

Graybar Announces Personnel Changes

Graybar Electric Co. recently announced new appointments in the West. As of July 1, D. B. Eardley became Northwestern District sales manager. Salt Lake City manager since 1956, he was at one time manager at Fresno and earlier was in charge of lamp sales in San Francisco.

Replacing Eardley at Salt Lake City is A. L. Nelson, transferred from San Francisco, where he headed outside construction sales. With the company since 1947, Nelson has been in lighting sales in Boise and Salt Lake City. George A. Johnson, son of Walter Johnson, takes over his San Francisco post.

Robert D. Gilbert has been promoted to Northwest District manager for appliance sales. Succeeding him as Portland appliance sales manager is Richard Mehren.

L. C. Owen Jr. was made Pacific District financial manager and H. V. Bell Southwestern District financial manager.

► General Electric's Insulator Department has named **T. E. Traugott** Western Zone sales manager, covering district offices in Dallas, Denver, Kansas City, Los Angeles, Portland and San Francisco. His headquarters are in Burlingame, Calif. **P. E. Jorgenson** will serve as district manager in the new Los Angeles sales district, which includes Arizona and southern sections of California and Nevada.

Traugott

► Prescolite Mfg. Corp. of Berkeley has announced two additions to its sales organization. **John Ludlow** will be sales representative for the Salinas, Monterey and San Francisco Peninsula areas, and **Pete Wyman** will handle the San Francisco Bay area. Both men will be headquartered at the company's home office in Berkeley. Ludlow was with Marvin Electric Mfg. Co. of Los Angeles before joining Prescolite last February and he was formerly associated with Coast Lighting Products and California Electric Supply Co. of San Francisco. Wyman, who also joined Prescolite in February, has been with Silvray Lighting, Curtis Lighting and Pittsburgh Reflector.

► **H. J. Meany** has been appointed vice-president and general manager of Thermador Division of Norris-Thermador Corp. Joining Thermador in 1945, Meany was made chief engineer in 1954 and factory manager at Waco, Tex., in 1955. He became vice-president and general manager of A. J. Lindemann & Hoverson Co., a wholly owned subsidiary, in 1956. After disposal of that operation in 1958, he managed the corporation's aircraft parts plant in Walnut, Calif.

► Appointment of **Stuart L. Forsyth** as general manager, comfort heating sales, has been announced by Montgomery Bros. of San Francisco. He had been electric heating product manager for Westinghouse Electric Corp. at Staunton, Va. With Westinghouse for the past 18 years, he had served in various executive sales-engineering capacities. For the past 15 years he had been responsible for activity relating to the company's heating equipment.

Forsyth

► **O. Reid Bigelow,** Salt Lake City, has been named vice-president of General Appliance Co., area distributor, succeeding **Walter J. Michelsen,** resigned. Bigelow, who has spent 30 years in the appliance industry of the Intermountain area, joined General Appliance in 1953. He was Zenith sales manager before his promotion.

► Hubbard & Co. has appointed **Hal J. Harris** as district sales manager for its Southwest Division. He will cover New Mexico and the northwest portion of Texas.

► Formation of **Hill Magnetic Products** to produce a line of special transformers and other items has been announced by Max E. Hill, former president of Hill Transformer Co. Headquarters are in Menlo Park, Calif., at 1055 O'Brien Drive.

Anaconda Promotes Tracy

Appointment of Albert W. Tracy as sales manager of its Western Region has been announced by Anaconda Wire & Cable Co. With headquarters at 120 Montgomery St., San Francisco, he will be responsible for six districts: Los Angeles, Seattle, San Francisco, Denver, Salt Lake City and Phoenix.

Tracy

A native of San Francisco, Tracy has been connected with the company since 1930, with most of his service in the Western states.

Anaconda also announced two changes in its Western sales organization. Albert H. Leader, formerly of the Seattle office, has been named district manager at Los Angeles. Harold M. Wenzel, has been named district manager at Seattle, succeeding Leader.

► Precision Magnetic Controls has changed its name to **Precision Multiple Controls** Inc. Western representatives of this firm, which makes photoelectric controls for outdoor lighting, are: **Wrathall & Krusi** Inc., 681 Market St., San Francisco 5; **Bill Horning Sales,** 902 Friedel Ave., Vancouver, Wash.; **Leonard M. Slusser,** 318 Dooly Block, Salt Lake City 1; **Industrial Engineering & Equipment** Corp., 2975 Wilshire Blvd., Los Angeles 5; **Jim Dawson** Co., 661 Delaware St., Denver 4.

► **Powerdyne** Inc., Oswego, Ore., manufacturer of pole top switches, has announced new representatives in the West: **Henry George Lehl,** 14280 S. W. Uplands Drive, Oswego, Ore.; **Matzinger-Johnson** Co., 1329 Willow St., Los Angeles 13; **Wrathall-Krusi** Inc., 681 Market St., San Francisco.

► A distribution transformer service center has been established in Richmond, Calif., by **R T & E** in its first exclusive service extension. L. M. Van Sandt, Richmond manager, reports that the new 10,000-sq-ft plant will repair, recore and uprate all makes of distribution transformers. It also will have complete testing equipment for running impulse, ratio and other industry standard tests. The Richmond plant will work in close conjunction with the company's manufacturing plant in Portland, Van Sandt said.

Announcing **2 New Industrial Products from EDWARDS**

entrance register

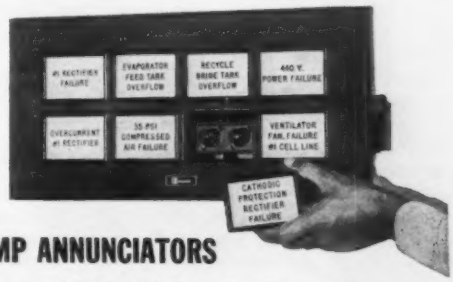
switchboard push button panel

Edwards new In-dicator system keeps track of key personnel. Telephone operators or receptionists can tell who's in at a glance, without wasting time or using noisy voice paging systems. Ideal for offices, plants, schools and institutions.

1 PERSONNEL IN-DICATOR

- When flipped by key personnel, toggle switches on entrance register automatically carry "in-or-out" data to switchboard panel.
- operator presses button adjacent to individual's name—lamps indicate "in-or-out".
- individual executive desk switches can be substituted for switch on entrance register panel.
- both systems install easily and quickly.

From Edwards long experience in annunciator systems comes this completely new line of lamp annunciators...developed in cooperation with leading utilities, chemical process and industrial plants. Here are some outstanding features:


#1 RECTIFIER FAILURE
EVAPORATOR FEED TANK OVERFLOW
RECYCLE BRINE TANK OVERFLOW
440 V. POWER FAILURE
OVERCURRENT #1 RECTIFIER
35 PSI COMPRESSED AIR FAILURE
VENTILATOR FAN FAILURE #1 CELL LINE
CATHODIC PROTECTION RECTIFIER FAILURE

2 INDUSTRIAL LAMP ANNUNCIATORS

- flexibility of indications—modular "plug-in" construction permits simple establishment or change (from the front) of operational sequences without altering terminals, connectors, or jumpers.
- wide selection of operational sequences to cover all requirements.
- indicating circuit provides extra contacts and terminals for data logging or other control functions.

EDWARDS

THE EDWARDS SELLING TEAM

Selected electrical distributors across the country stock and sell Edwards products. Recognized electrical contractors install them. Edwards technical representatives in 58 cities throughout the United States and Canada work with them from initial planning through installation and follow-up, to guarantee complete satisfaction.

Edwards Company, Inc.
Norwalk, Connecticut

Please tell me more about the following products:

☐ the new Personnel In-dicator. ☐ the new Lamp Annunciators.
☐ both the In-dicator system and the Lamp Annunciators.

Name_____

Title_____

Company Name_____

Address_____

PRODUCT NEWS

New Designs and Applications

New Design Features Incorporated in 4,160-v equipment

(1) *I-T-E Circuit Breaker Co., Philadelphia, Pa.*

Stored energy closing and ironless blowout are features of 4,160-v circuit breakers and switchgear incorporating completely new design. First to combine the two in this voltage rating, the equipment is said to give faster fault interruptions, faster closing of contacts and to be smaller in size than comparable units in the 4,160-v field.

Increased safety for personnel and equipment, easier handling and simpler installation, maintenance and service are other advantages pointed out by the manufacturer.

Front accessibility to all secondary wiring (see illustration at right) simplifies installation as well as maintenance and service. Compartment is designed so that control wiring can enter from top or bottom, through cable troughs to terminal blocks in the separate (upper) instrument compartment. Current transformers can be replaced from front of breaker compartment by removing shutter covering main contacts. Shutters are blocked open in the picture to show primary leads.

Compact size and low center of gravity make for easier, safer handling, according to the manufacturer, who states that one-man maintenance is a feature.

Other features listed: closed door drawout and indication of breaker position in compartment; rigid construction; improved bus and wiring design.

Types of construction available include the conventional indoor arrangement and two outdoor configurations, standard enclosed and full walk-in.

Aerial Cable Hardware

(3) *Hubbard & Co., 200 S. Michigan Ave., Chicago 4, Ill.*

The manufacturer has introduced a new line of aerial cable material. Hubbard-Park plexiglas spacer; tangent mounting brackets; pole top, corner and crossarm mounting brackets are available; as are grommets for all standard size cables.

Rigid Conduit

(4) *Harvey Aluminum, 19200 S. Western Ave., Torrance, Calif.*

Full production of a line of rigid aluminum conduit has been announced by this manufacturer. Included are elbows and couplings in a complete range of standard trade sizes up to 6 in. Larger sizes can be produced to meet trade specifications. The new conduit is UL approved. It is being marketed through regularly established distributors.

Aluminum Housing

(5) *Killark Electric Mfg. Co., Vandeventer and Easton Ave., St. Louis 13, Mo.*

A compact, all-aluminum housing for sizes 0 and 1 magnetic motor starters is designed for use in both hazardous and nonhazardous locations. This GMSM series is adaptable to custom hub arrangements. Housings are furnished with front operation for start-stop and reset buttons or with reset button only.

(For more data, use coupon on page 102)

Dry-Type Transformer

(2) *Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.*

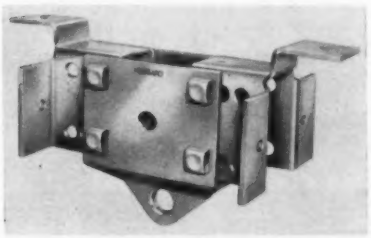
A new line of general purpose, ventilated, dry-type transformers is available in ratings 3 through 50 kva, single phase, 600 v and below. Designed for indoor use, the new transformer is said to be easy to install because of smaller size and lighter weight. Knockout locations are provided for connecting standard size conduit from either side or bottom. According to the manufacturer, the entire installation can be accomplished in less than 40 minutes.

Double-Coat Paints

(6) *Subox Inc., Fairmount Plant, Hackensack, N. J.*

A single brush applied coat of its new "double-coat" paint will produce a dry film thickness of 3 to 4 mils, equivalent to two coats of standard paints, the manufacturer claims. A smooth surface is produced where surfaces are rough or uneven, and when applied over properly prepared surfaces, double-coat paint brushes easily or may be applied by spray, the manufacturer states. With repeated passes of a spray gun as much as 6 mils of paint may be applied without runs or sags, it is claimed.

The paint air dries in 48 hours under normal atmospheric conditions. After 24 hours it is not affected by rain or generally wet weather conditions. Flash point is over 100 F. According to the manufacturer, initial test reports from utilities indicate excellent promise for transmission tower and substation use.



Adjustable Phase Fitting

(7) *Hubbard & Co., 200 S. Michigan Ave., Chicago, 4, Ill.*

This manufacturer has announced a phase fitting that will adjust to normal variations in crossarm spacing on double arm transmission structures, as well as to all standard arm sizes. The adjustable phase fitting can be locked in five different positions to provide spacings from 8½ to 12½ in. in 1-in. steps. Formed from ¼-in. steel plate, hot galvanized, the device gives the strength of an integral unit once the assembly bolts are tightened, the manufacturer states.

Wire Connector

(8) *Minnesota Mining & Mfg. Co., Dept. WO-225, 900 Bush Ave., St. Paul 6, Minn.*

A self-stripping communication wire connector is also self-sealing and preinsulated. According to the manufacturer, this Scotchlok brand connector, type UR, splices, insulates and moisture-seals in two simple steps, saving up to one-third to one-half the time required for conventional twist and sleeve splices.

It is designed to accommodate any two- or three-wire combination of No. 19 to No. 26 AWG solid or No. 20 to No. 26 AWG stranded wire, and handles all common types of insulation. The resulting splice is claimed to be the functional equal of twist and solder jointing methods, with an average pullout resistance equal to 95% of wire breaking strength.

Ground Devices

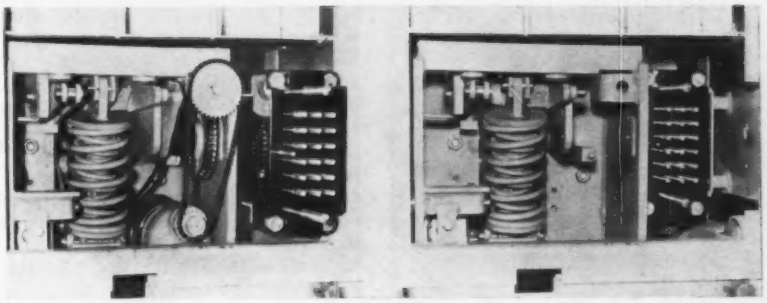
(9) *Circle F Mfg. Co., Trenton 4, N. J.*

Complying with revisions to the National Electrical Code, this manufacturer has added a new line of 20-amp, 125-v, three-wire U ground devices. Included are duplex receptacles in brown and ivory, duplex receptacles on 4-in. covers in brown, and armored caps.

Roller Arm

(10) *Square D Co., 4335 Valley Blvd., Los Angeles 54, Calif.*

A new roller arm available for the manufacturer's type AW limit switches can be adjusted to any length between 1 and 4 in. A change is made by loosening an Allen head screw and sliding the arm up or down to the desired position. A scale on the side of the arm is marked in ⅛-in. increments for easy adjustment. The roller can be turned to the inside or the outside of the arm for varied cam track locations, and roller diameters of ⅝ in. and 1 in. are available.



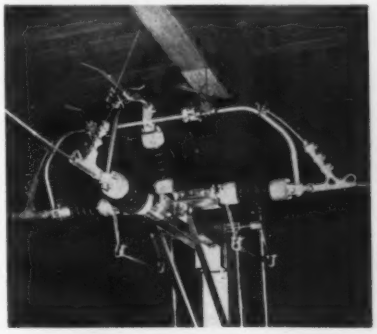
Breaker Mechanism

(11) *Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.*

A new line of "stored energy" charged spring mechanisms, operating both manually and electrically, has been introduced for use in the manufacturer's 5- and 15-kv DST magnetic air circuit breakers.

The illustration at the left shows the motor-operated mechanism which is designed so that a breaker is always in a charged condition. Whenever the stored energy device is discharged, it is immediately recharged by a small electric motor, the manufacturer reports.

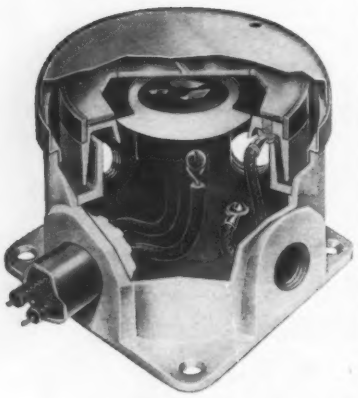
At right is the manually operated mechanism. According to the manufacturer, the outside power source for closing or tripping may be eliminated and charging can be accomplished with a single 60° downward stroke of the handle. The new machine is claimed to provide extended mechanical life and greater maintenance-free operation of the circuit breaker.



Line Tap Switch

(12) *Powerdyne Inc., 17150 S. W. Boones Ferry Rd., Oswego, Ore.*

A new design in the power transmission field is this complete switching scheme for mounting on a single pole. The manufacturer states that this is not merely an adaptation, that it is a wholly new switch design



LATROBE
ADJUSTABLE
CAST IRON BOX

NOW ONE POUR OPERATION

This No. 130 cast iron, adjustable floor box comes with 3½" or 4¼" brass cover plate and 2" abandon plug for power or ½", ¾" or 1" for telephone service. All adjustable boxes are equipped with ground wire.

A 2 part tin lid is provided in order to pour concrete to very top in one operation. After concrete is hardened, the top part of the 2 part tin lid can be removed along with top adjusting section providing all the room you need for wiring.

Listed under re-examination services of Underwriters Laboratories, Inc.

LATROBE
PIPE OR CONDUIT HANGERS

For hanging ½" thru 1½" pipe or conduit to steel beams up thru ⅜" thick—parallel or at any angle — no drilling necessary. Ideal for confined areas.

Sales Representatives in all principal Cities:

PAYNE & SLOAN
1101 East 5th St. Los Angeles 13, Calif.

L. F. CHURCH COMPANY
750 Natoma Street San Francisco 3, Calif.

HARVEY M. OLMSTEAD COMPANY
PO Box 5512 T.A. Denver 17, Colo.

NELSON ENGLISH
1238 N. W. Glisan St. Portland 9, Ore.

R. C. ENGLISH & ASSOCIATES
4229 122nd, S. E. Bellevue, Wash.

SOLD ONLY THRU WHOLESALERS

Fullman
MANUFACTURING
COMPANY
1209-1215 JEFFERSON ST.
LATROBE, PENNSYLVANIA

that fits into the line and becomes an integral part of it. Advantages claimed: economy in original cost and final installed cost; lightweight for easy installation; maintenance free and reliable service performance.

The switch is equipped with a quick-break attachment that extends its use to line dropping and transformer magnetizing current interruption. Basic engineering design features are described in Sec. 1 of the manufacturer's catalog.

Dual-Range Demand Register

(13) *Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.*

New dual-range demand registers for use with watt-hour meters can be converted from their nominal operating ranges to alternative 200% ranges by removing, reversing and replacing a double-surfaced scale plate.

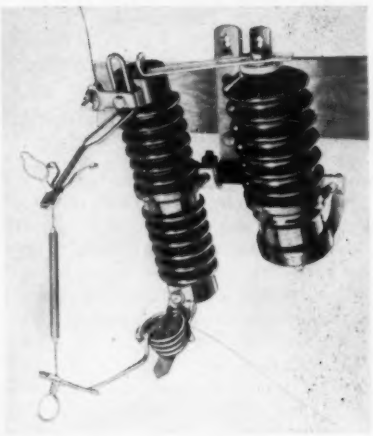
Another design change permits a large reduction in open time, the company states. In the Mark I demand register, open time has been reduced to a fraction of a second, from earlier values of six to seven seconds, it is reported.

This register will be available in all standard capacities, with combination class 2 and class 6 scale ranges, or a combination of class 3 and class 5 scales. Standard intervals will be 15, 30 and 60 minutes, but provision can be made for intervals as great as four hours.

Baseboard

(14) *Spartan Electric Radiator Corp., 52-55 74th St., Maspeth 78, N. Y.*

A 2-ft electric baseboard has been added to the manufacturer's line. The new model, B5, has a 500-w power rating with a shipping weight of 8 lb.



Cutout-Arrester Combination

(15) *A. B. Chance Co., Centralia, Mo.*

The manufacturer's 7.8-kv open link cutout now comes with a valve-type lightning arrester to give a low-cost, cutout-arrester combination for use on rural distribution lines. Big advantage of these units, according to the manufacturer, is the cost savings over buying individual cutouts and arresters. They also can be installed faster and more economically and take up less space on the crossarm, it is claimed.

Permafil-Treated Tape

(16) *General Electric Co., Schenectady 5, N.Y.*

A semicured, permafil-treated glass cloth can be easily applied to coils and cured without pressure, the manufacturer states. It is claimed that the new development will make machine taping of coils with a semicured tape economically feasible.

Chief advantages, company engineers say, are that an interliner is not required and conventional dip and bake process of curing tapes will be eliminated.

Rated for class B operation, the tape is available in thicknesses of from .005 to .011 in. Although designed primarily for use on motor armature or field coils, it can be used to tie down field coils and band armatures and the exposed end of commutator cones, the manufacturer states. It can also be used in the manufacture of laminates and molded forms.

Radiant Heat Panel

(17) *Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.*

Chromalox type QRP is a new electric radiant heat panel for commercial and industrial applications. Panels are equipped with quartz tube elements, the manufacturer states, and the series is designed to provide excellent terminal and resistor life and to secure maximum serviceability from the quartz heat source. Dimensions are 1 x 4 ft. Four- and 6-kw panels are available for 208 and 240 v. The 240-v elements may be connected in series for operation on 480 v. Details in the company's bulletin PG-104.

Pothead Line

(18) *G&W Electric Specialty Co., 3500 W. 127th St., Blue Island, Ill.*

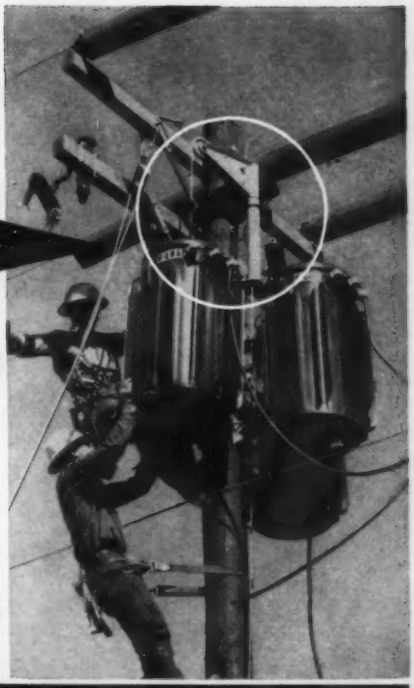
Rated 69 to 345 kv, type AT potheads for pipe-type cable have been improved to meet increasing demands for high-voltage cable terminations, the manufacturer has announced. It is stated that variations in grade resulting in up to 200-psig hydrostatic pressure in the cable can easily be accommodated.

Oil Switch

(19) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

A new single-phase oil switch was designed to permit manual sectionalizing and load breaking on heavily loaded distribution lines. According to the manufacturer, this type J switch can safely carry and interrupt its full rated current of 400 amp at voltages ranging from 2.4 to 14.4 kv. It has a momentary current rating of 13,500 asymmetric amp.

Cut costs... Provide greater safety with a MoPeCo Transformer Hoist



- One position base mounting
- Swivel head permits multiple mounting
- Lightweight 2 piece portable unit (42 lbs.)
- Assembles easily at top of pole
- Tested at 3000 lbs. lift on cable
- Uses steel cable or manila rope

Save time with the MoPeCo hoist. You can install 3 transformers in only 30 minutes!

Order through your favorite distributor

Write or call
MORRISON-PELSUE CO.
Denver, Colorado
2001 So. Bannock St. RAce 2-2834

FOR SALE

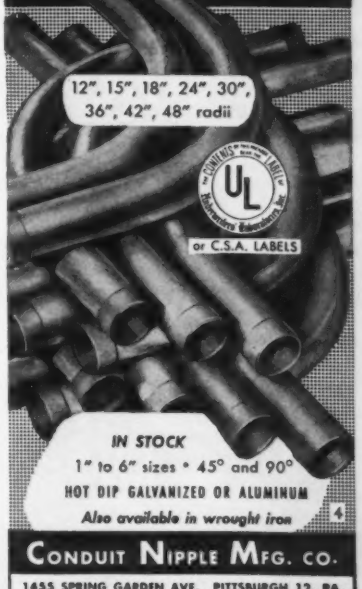
A Successful Electrical Business in the heart of the Mother Lode Country. Hunting and Fishing. Next door to Yosemite National Park. Must sell because of Health. Terms. Write J. LeMoine Close, P O Box 166, Mariposa, Calif.

WANTED

Active New York State Distributor seeks additional manufacturers' lines to stock and sell to gas and electric utilities. Write Box 313, Electrical West, 68 Post Street, San Francisco 4, Calif.

Are You Receiving
ELECTRICAL WEST
For only $3 you will receive 12 regular monthly issues, plus 12 Mid Month Newsletters and the annual Buyers' Guide & Directory.
Just put your name, residence address, title and company on a post card and mail to: Electrical West, Circulation Dept., 68 Post St., San Francisco 4, Calif.

Special Large Radius
RIGID *Conduit* ELBOWS



IN STOCK
1" to 6" sizes • 45° and 90°
HOT DIP GALVANIZED OR ALUMINUM
Also available in wrought iron
4
CONDUIT NIPPLE MFG. CO.
1455 SPRING GARDEN AVE. PITTSBURGH 12, PA.

KLEIN
-KORD
NYLON
SAFETY
STRAPS

WITH THESE FEATURES

Klein developed the first fabric safety strap and have pioneered in every development. The recently introduced Klein-Kord Nylon Safety Strap offers these features:

LONGER LIFE—Superior construction, woven from filament nylon. Stretch has been almost eliminated.

PLY ADHESION—The multiple plies of strongly woven pre-dipped nylon are frictionized in neoprene and vulcanized.

FLEXIBILITY—Klein-Kord Nylon Safety Straps are extremely flexible and assure maximum comfort and greater strength. When tested in use, these straps are capable of a test load of 2750 pounds, far in excess of any load they will be called upon to support in service.

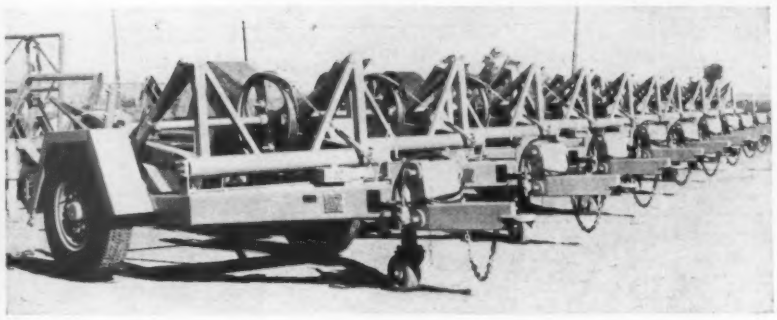
QUALITY HARDWARE—All buckles and snaps are drop-forged and tested by Klein in their own forge shop.

WRITE FOR BULLETIN 560

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corp., New York

Mathias Klein & Sons
Established 1857 Chicago, Ill., U.S.A.
INCORPORATED
7200 McCORMICK ROAD, CHICAGO 45, ILL.



Reel Carrier

(20) *Petersen Engineering Co., Santa Clara, Calif.*

A sturdy straddle-type reel carrying dolly designed for use on any kind of line stringing operation has been added to the Pengo line. Model 6100 HLRC PENGO reel carrier will take any reel up to 46 in. wide by 84 in. in diameter and weighing to five tons. It is self-loading by means of a manually operated hydraulic system, the manufacturer states. Both a smaller and a larger unit of similar design are available.

Noninterchangeability Protection

(21) *Murray Mfg. Corp.*, 1250 *Atlantic Ave., Brooklyn* 16, *N.Y.*

The manufacturer announces that its MP fully magnetic circuit breakers and load centers have been modified to conform to noninterchangeability requirements of the National Electrical Code, Par. 240-25, effective July 1, 1960.

Its method of noninterchangeability makes installation easy and does not require wholesalers and contractors to maintain two types of breakers and load centers, the manufacturer claims.

NI breakers may be used with enclosures previously manufactured whether installed or not. Single- and double-pole noninterchangeable MP breakers are made in three classes: 0 to 20 amp, 21 to 50 amp and 51 to 70 amp.

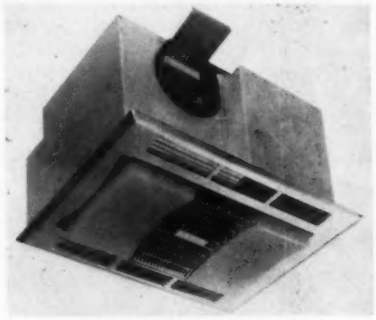
Panelboards

(22) *Square D Co., 4335 Valley Blvd., Los Angeles* 32, *Calif.*

Ratings of the manufacturer's line of NQO panelboards have been expanded so that protection for power loads can be combined in the same panelboard with lighting and appliance circuits.

Available from distributor stock, these boards feature plug-in construction for on-the-job assembly. The basic devices come with main lug ratings up to 600 amp. Square D types Q0 and Q1 plug-in branch circuit breakers are offered in one-, two- or three-pole construction with ratings from 15 to 100 amp.

When desired, type NQ0 (plug-in) and NQOB (bolted connection) panelboards are available factory assembled for shipment direct to job.



Heating Equipment

(23) *Westinghouse Electric Corp., Air Conditioning Division, Stauton, Va.*

A new line of ceiling-mounted residential electric heating equipment includes three models claimed to be particularly suited for easy installation in kitchen or bathroom. Each unit mounts in a recessed position into the ceiling so that only the grille is visible.

The line includes a heater-light-fan unit, combining in one device a 1,200-w heating capacity, two 60-w lamps and a 175-cfm fan. It can be mounted between joists.

A compact heater-and-light unit, rated at 1,200 w for heating and using two lamps, and a unit with heater only, rated at 1,000 w, are also available. All models include built-in thermal protection devices that turn the unit off to prevent overheating.

Meter Mount

(24) *Sangamo Electric Co., Springfield, Ill.*

Designed for metering all types of service, a universal meter mount that contains current and potential transformers has been announced by this manufacturer. It is combined with the manufacturer's new P6S universal meter for application flexibility and is used for metering all types of service up to 480 v and loads through 300 amp. The manufacturer states that it is approximately the size of a class 200 meter socket and is priced competitively with existing four-wire class 200 self-contained meter installations.

The type P6S is similar to standard class 10 two-stator polyphase meters, according to the manufacturer, but the current elements consist of two separate current coils wound on each of the two-current element cores. Each potential element consists of two 120-v coils that can be connected in series or parallel to give a full torque meter for all service connections.

Proper connection of the elements is accomplished through four dual-current bayonets and eight potential bayonets in the meter base, a design that allows for measurement of services to 277 v.

Tool

(25) *James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo.*

A new hydraulic compression tool is designed to work compression connections hot on all wire sizes from No. 6 solid through 636 mcm ACSR. Die sizes of this WH-2 include those now covered by the manufacturer's WH-1 tool as well as additional sizes required to install fittings on large conductors.

A two-step, high-speed pump exerts 21,000 lb of thrust. An automatic overload valve prevents overcompression. Interchangeable insulated handles are available in six lengths to adapt the tool to various voltage requirements.

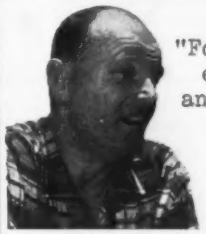
Fiber Glass Strain Insulators

(26) *Hubbard & Co., 200 S. Michigan Ave., Chicago 4, Ill.*

A new line of strain insulators made of fiber glass is said to be lighter in weight, impervious to decay, moistureproof and exceptionally durable. No arcing horns are necessary, the manufacturer says.

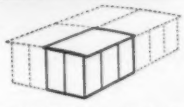
PMC
FIELD
PROVEN
CONTROL

OVER 250,000 INSTALLATIONS!
A complete line of precision photoelectric controls & accessories for outdoor lighting.
PRECISION MULTIPLE CONTROLS., RIDGEWOOD, N. J.



"For a combination electrical field office and storage shed that's quick to move on and off the job, I like Porta House. We have them on several jobs."

Just telephone Porta House collect and get immediate delivery. Prefabricated, bolted, waterproof plywood panels—can be moved on a pick-up truck.



SIZES 6' OR MORE BY 9' OR MORE.

PORTA HOUSE

Ridgely K. Dodge 6767 Broadway Terrace, Oakland, Calif.
Phone collect for immediate delivery: OLympic 2-7237

TO LOCATE WESTERN SUPPLIERS OF ELECTRICAL PRODUCTS

Look It Up First

In Electrical West's

Buyers' Guide and Directory

1961 Edition sent to all subscribers in November. Extra copies available $1.00 each. Write to Circulation Mgr., Electrical West, 68 Post St., San Francisco 4, Calif.

BULLETINS ETC.

(27) INSULATION—An eight-page manual giving minimum specifications for insulation to meet demands of more extreme winter and summer climatic conditions is offered by Forty-Eight Insulations Inc., P.O. Box 472, Aurora, Ill. Also listed are special requirements of ceiling-heated houses and those in which rates of air change or the area of window glass are greater than the values used for the establishment of the All Weather Standard.

(28) SPLICING — Step-by-step information on splicing and terminating both shielded and unshielded rubber-neoprene cables is available in bulletin 1134 from the Okonite Co., Passaic, N.J. Selector and quantity estimating charts are included. Okonite is also offering two 16-mm Kodachrome colored films entitled "Spliced for Life."

(29) CAPACITORS — Bulletins 8146 and 8147, published by Federal Pacific Electric Co., covers low-voltage and high-voltage Cornell-Dubilier power-factor capacitors. These bulletins may be secured from Federal Pacific, General Offices, 50 Paris St., Newark 1, N. J.

(30) WIRE AND CABLE—Catalog WC-859 gives data on Walker Bros. wire and cable. It includes physical properties of insulating materials and a partial presentation of plant facilities. Available from Walker Bros., Conshohocken, Pa.

(31) MARKERS—Pipe and electrical markers, numerals, safety signs and identification signs are listed in a new catalog issued by North Shore Nameplate, Bayside 61, N. Y.

(32) BUYING AND SELLING — Designed to erase the "hazy middleground" between buyer and seller, a new publication entitled "Some Economic Considerations in Buying and Selling in an Industrial Market" points out that a sale and a purchase are just two aspects of the same transaction. It goes on to suggest ways in which buyers and sellers can work more closely to their mutual advantage. The bulletin discusses value, price-volume-cost relations, durative procurement value and other topics. Charts and examples that relate value to such factors as growth behavior of kilowatt peaks, kilowatt-hours, gross national products and disposable income are included. Available from General Electric Co., Schenectady 5, N. Y.

(33) TIME SWITCHES—Wiring diagrams for control of heating, lighting, ventilating and air conditioning are featured in a seven-day time switch bulletin issued by Tork Time Controls Inc., Mount Vernon, N. Y. Dimension drawings of enclosures and mounting brackets and information on capacity and reserve power are also included in the booklet.

(34) PORTABLE CORDS—In a new 52-page manual, Kaiser Aluminum & Chemical Sales describes its portable cords and cables, giving data on insulation and jacket compounds. Specifications and characteristics of various types of portable cords are listed. Copies may be secured from the manufacturer, Dept. NR-43, 300 Lakeside Drive, Oakland 12, Calif.

(35) REVISED—Of interest to utility engineering and purchasing departments is a 100-page revision of "Aluminum Electrical Conductors-General Engineering Data." Copies may be secured from Alcoa-Rome sales offices or from 736 Alcoa Bldg., Pittsburgh 19, Pa.

(36) BREAKERS—I-T-E is offering a bulletin on its new Trend-Line power circuit breakers. This line is available in the subtransmission ratings 14.4, 23, 34.5 and 46 kv, with mva from 500 to 1,500.

(37) RELAYS—A six-page condensed catalog describing its line of protective relays has been issued by Federal Pacific Electric Co. Bulletin 6200 may be secured from that manufacturer, 50 Avenue L, Newark, N. J.

(38) TOOLS — More than 60 time-saving tools are described in a new eight-page bulletin, E-240, from Greenlee Tool Co., Rockford, Ill. Included are items of particular interest to the electrical, construction, telephone and pipe fitting trades.

(39) MI CATALOG—New sections are included in General Cable's revised Safety Mineral Insulated Catalog. One covers hazardous area uses which have been approved by UL. Another covers MI for instrumentation purposes. The catalog is available from the manufacturer at 730 Third Ave., New York 17.

(40) PRICE LIST—Prices of Pengo augers and boring head parts and accessories are available in a new bulletin from Petersen Engineering Co., 460 Kifer Road, Santa Clara, Calif.

(41) POWER FUSES—Application of SMD fuses is discussed in bulletin 261 from S&C Electric Co., 4435 N. Ravenswood Ave., Chicago 40, Ill.

(42) CAPACITORS—Westinghouse is offering a 12-page booklet on use of industrial capacitors. Answering many application questions, booklet B-7642 is available from Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa.

(43) MOLD METHODS—Methods of forming molds for casting resins by vacuum-drawing heated thermoplastic sheets over electrical components are described in an eight-page booklet from 3M. Copies may be secured from Dept. WO-141, Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.

(44) CATALOG — Low-voltage distribution equipment is covered in the 1960 edition of G-E's Buy Log. Issued jointly by Distribution Assemblies and Circuit Protective Devices Departments, this catalog is available from Distribution Unit, General Electric Co., Plainville, Conn.

(45) FITTINGS—A new line of flat conductor cable connectors and accessories is described in a new booklet from the Thomas & Betts Co., Elizabeth 1, N. J. The new line goes under the trade mark POS-E-KON.

(46) FIXTURES—Vaportight light fixtures are described in a new catalog supplement from Killark Electric Mfg. Co., Vandeventer and Easton Ave., St. Louis, Mo.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after September 1

Please send me, without obligation, the new product information or catalogs

If described in Product News, circle item number

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46

If described in advertising, fill in page number

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

July 1960

Allis-Chalmers Mfg. Co. 41, 43
San Francisco ..... DOuglas 2-8384
Los Angeles ..... MAdison 6-2231
Phoenix ..... CRestwood 4-5426
Denver ..... CHerry 4-6556
Salt Lake City ..... EMpire 3-1723
Portland ..... CApitol 2-9835
Seattle ..... MAin 4-3737

Anaconda Wire & Cable Co. 90, 91
San Francisco ..... YUkon 6-0051
Los Angeles ..... MAdison 6-2371
Denver ..... AComa 2-0616
Seattle ..... MAin 3-4686
Salt Lake City ..... ELgin 5-3401

BullDog Electric Products Div. 44, 45
(See listing under I-T-E Circuit Breaker Co.)

Carol Cable Co., Div. Crescent Co., Inc. ..... 3rd cover
San Francisco: F. M. Nicholas ..... YUkon 2-1964
Los Angeles: Payne & Sloan, Inc. ..... MAdison 4-7317
Seattle: Bruce-Emmett Co. ..... MUtual 2-6737
Portland: Bruce-Emmett Co. ..... BEImont 2-8117

Chance Co., A. B. 4
Burlingame, Calif. ..... OXford 7-1545
Seattle ..... MAin 3-6886
Portland ..... CApitol 8-3866
Los Angeles ..... LUdlow 2-1090
Bountiful, Utah ..... AXtel 5-7144

Circle Wire & Cable Co. 21
Sub. of Cerro de Pasco Corp.
San Francisco: Brill Electric Sales ..... SUtter 1-7547
Los Angeles: Elkins Electric Agency ..... ANgelus 8-3385
Seattle: Electric Agencies ..... MAin 3-2360

Classified 99

Clifton Conduit Div. General Cable 40
San Francisco: The Baxter Co. ..... MArket 1-8636
Los Angeles: Michel Bros. ..... AXminster 2-9191
Seattle: Northwestern Agencies ..... MAin 3-8882
Portland: Northwest Sales Co. ..... CApitol 3-5959

Conduit Nipple Mfg. Co. 99
San Francisco: George Gray Co. ..... HEmlock 1-1526
Los Angeles: Hayjax Co. ..... MAdison 8-5256
Portland: Pacific Elec. Sales Co. ..... BEImont 5-4137
Denver: Reitz Sales Co. ..... EAst 2-6200

Copperweld Steel Co. 46
San Francisco ..... DOuglas 2-6979
Bellevue, Wash. ..... GLencourt 4-1233

Day-Brite Lighting, Inc. 86, 87
San Francisco ..... YUkon 6-2443
Santa Clara ..... AXminster 6-6154
Los Angeles ..... DUnkirk 7-2307
Portland: Otis A. Taylor ..... BUtler 9-8518
Seattle: D. A. Olson Co. ..... MElrose 3-4133
Denver ..... MAin 3-3221
Phoenix: Wm. Benndorf Co. ..... CRestwood 7-1662
Albuquerque: James Hallek ..... DIamond 4-3235
Salt Lake City: Stevens Sales ..... INgersol 7-5489

Delta-Star Electric Div., H. K. Porter Company Inc.
(See listing under Hill)

Edwards Company, Inc. 95
Los Angeles ..... MAdison 8-2286
San Francisco ..... UNderhill 1-5800
Denver: H. F. Ream Sales Agency ..... CHerry 4-0558
Phoenix: J. A. Ware, Jr. ..... Alpine 2-9388
Portland: D. A. King ..... CApitol 8-1990
Seattle: F. A. Strohecker ..... MAin 3-0357
Spokane: E. Johnston ..... MUtual 2-3597

Electro Compound Co. 104
Los Angeles: Golsan Co. ..... RIchmond 7-5486
Portland: Oregon Mfg. Agents ..... Capitol 6-3971
Denver: R&M Sales ..... Spruce 7-2515
San Francisco: Electrical Sales Co. ..... EXbrook 7-2087

Enjay Chemical Co. Div. Humble Oil & Refining Co. 22, 23
San Francisco ..... GArfield 1-8979
Los Angeles ..... DUnkirk 5-3297

Fanner Mfg. Co. 2, 63
San Francisco: Sold Through Line Material Industries ..... PLaza 5-8600
Los Angeles ..... RAymond 3-6251 and OXford 5-2260
Phoenix ..... ALpine 4-8471
Denver: Slaybaugh & Thompson ..... AComa 2-5826
Portland: A. L. Polich, Inc. ..... CApitol 3-6241
Seattle: A. L. Polich, Inc. ..... WE 2-9011

Federal Pacific Electric Co. 14, 15
San Francisco ..... ATwater 2-0810
Los Angeles ..... CLinton 7-8281
Seattle ..... ATwater 3-7801
Oswego, Ore. ..... NEptune 6-4573
Salt Lake City: James Stephens Co. ..... ELgin 5-3540
Denver: R. D. Florence Co. ..... AComa 2-1573
Hamilton Associates ..... CHerry 4-1505
Albuquerque: F. W. Gorman ..... CHapel 7-1596
Phoenix: Elec'l. Eng. & Sales Corp. ..... ALpine 3-0927

Fullman Mfg. Co. 98
San Francisco: L. F. Church ..... UNderhill 1-2840
Los Angeles: Payne & Sloan ..... MAdison 4-7317
Denver: Harvey Olmstead ..... TAbor 5-6264
Bellevue, Wn.: R. C. English ..... GL 4-0566
Portland: Nelson English ..... CApitol 3-9814

Gedney Electric Co. 26
San Francisco: Baxter Co. ..... MArket 1-8636
Los Angeles: Rutkin Electric Sales ..... MAdison 3-1224
W. S. Sanderlin Co. in following cities:
Seattle ..... ATwater 4-7777
Portland ..... BEImont 5-0121
Salt Lake City: George Darger Co. ..... ELgin 5-2873

General Electric Co. Cleveland, Lamp. Div. 42
Oakland ..... LOckhaven 9-3222
Los Angeles ..... DUnkirk 5-1681
Denver ..... AMhurst 6-0285
Seattle ..... MAin 2-8081
Portland ..... CApitol 3-2101

General Electric Co. Schenectady, Apparatus Div. 6, 7, 17, 18, 19, 20, 29, 34, 35, 52, 53
San Francisco ..... DOuglas 2-3740
Los Angeles ..... MAdison 5-7381
Phoenix ..... ALpine 8-7724
Denver ..... KEystone 4-7171
Boise 4-3021
Salt Lake City ..... EMpire 4-1891
Portland ..... ATwater 8-0281
Seattle ..... MAin 4-8300

Graybar Electric Co. Inc. 88, 89
San Francisco ..... MArket 1-5131
Los Angeles ..... ANgelus 3-7282
Phoenix ..... ALpine 2-2371
Denver ..... TAbor 5-7111
Boise ..... BOise 3-2594
Butte ..... BUtte 3233
Portland ..... ATlantic 8-5661
Seattle ..... MUtual 2-0122
Salt Lake City ..... ELgin 9-8771
Spokane ..... FAirfax 7-6611
Tacoma ..... MArket 7-0164
San Diego ..... BEImont 3-1361
Tucson ..... MAin 2-6439
Sales offices in following cities: Bakersfield, Fresno, Long Beach, San Jose, Oakland, Oceanside, Sacramento, San Bernardino, Santa Ana, Santa Barbara, Van Nuys, Calif.; Colorado Springs, Colo., and Eugene, Ore.

Gulf Publishing Co. 104

Harvey Aluminum Sales Inc. 16
Torrance, Calif. ..... SPruce 5-2181
San Diego ..... CYpress 6-6101
Berkeley ..... THornwall 5-3133
Seattle ..... ATwater 3-4990

Hill Transformer Works ..... 4th Cover
Delta-Star Electric Div., H. K. Porter Co. Inc.
San Carlos ..... LYtell 1-4461
Albuquerque: Ralph B. Black ..... ALpine 5-9625
Los Angeles ..... MAdison 6-5651
Phoenix:
Daley Elec. Sales Co. Inc. ..... ALpine 2-2326
Salt Lake City:
Stevens Sales Co. ..... INgersol 7-5489
San Francisco ..... GArfield 1-2916
Seattle ..... MAin 4-7066
Tucson: Daley Elec. Sales Co., Inc. ..... AXtel 5-5378

Hubbell, Inc., Harvey 5
San Francisco ..... MIssion 7-3240
Los Angeles ..... MAdison 8-7226
Denver: Paul A. Douden ..... KEystone 4-6798
Spokane: Elmer Johnson ..... MAin 2518
Seattle: Frank A. Strohecker ..... MAin 3-0357
Portland: David King ..... CApitol 8-1990

Indiana Steel & Wire Co. Inc. 94
(Distributed by Graybar, all branches)
San Francisco ..... MArket 1-5131
Los Angeles ..... ANgelus 3-7282
Portland ..... ATlantic 8-5661
Seattle ..... MUtual 2-0123
Denver ..... TAbor 5-7111
Salt Lake City ..... ELgin 9-8771

I-T-E Circuit Breaker Co.
South San Francisco ..... PLaza 6-8660
Los Angeles ..... MAdison 2-7134
Denver ..... AMherst 6-1404
Phoenix ..... CRestwood 9-9666
Seattle: Garland-Affolter Eng. Corp. ..... MUtual 2-4958
Portland: Garland-Affolter Eng. Corp. ..... CApitol 3-7349
Salt Lake City: Riter Eng. Co. ..... INgersol 7-9449
Butte: McDonough, R. E. ..... BUtte 2-5447
El Paso: R. L. Brewer Co. Inc. ..... KEystone 2-7651

BullDog Electric Products Div. 44, 45
Oakland: Safety Switchboard Co. ..... LOckhaven 2-4945
Los Angeles: BullDog Elec. Products of L. A. ..... OVerbrook 5-8200
Portland: Coast Elec. & Mfg. Co. ..... ATlantic 8-5373
Denver: Young Elec. & Mfg. Co. ..... AComa 2-4841

Kearney Corp., James R. 30
Maydwell & Hartzell, Inc., in following cities:
San Francisco ..... ATwater 8-6900
Los Angeles ..... MAdison 8-7245
Seattle ..... MAin 4-2368
Portland ..... CApitol 8-4173
Spokane ..... MAdison 4-3285
Phoenix ..... ALpine 2-5858
San Diego ..... CYpress 6-2245
Salt Lake City: Conely Engineering Co. ..... EMpire 3-5013
Golden, Colo.: Robert C. Smith ..... CRestview 9-5279

Kerite Co. 50
San Francisco ..... GArfield 1-2916
Glendale, Calif. ..... CHapman 5-3721
Seattle: Fred Carlson ..... ATwater 4-4360

Klein & Sons, Mathias 100
Glendale, Calif. ..... CItrus 3-3523
Redwood City, Calif. ..... EMerson 9-2274

Lapp Insulator Co. Inc. 48, 49
San Francisco: Donald E. Ingalls ..... JUneau 6-0332
Los Angeles: Earl S. Condon & Co. ..... DUnkirk 1-3951
Seattle: Charles F. James ..... MAdison 3-1531
Salt Lake City: Riter Engineering Co. ..... EMpire 3-7933
Butte: R. E. McDonough Co. 2-5447
Albuquerque, N. M.: Smith Sales Co. ..... AXtel 9-8024

McCabe Powers Body Co. 3
Berkeley ..... LAndscape 4-4416
Portland ..... BEImont 6-1178
Phoenix ..... BRidge 5-5774
Salt Lake City ..... DAvis 2-5658
Spokane ..... FAirfax 5-2591
Los Angeles ..... RIchmond 9-3424

(Continued on page 104)

SAVE ESTIMATING TIME

Estimator's Electrical Manhour Manual

By JOHN S. PAGE and JIM G. NATION

Price **$10.00**

The scores of manhour tables in this manual contain literally thousands of easy-to-use listings. These listings are valuable guides to estimating manhours in every phase of electrical installation. They are the result of hundreds of time-and-method studies, coupled with actual labor costs on numerous projects.

With these manuals you'll know how to arrive at a composite rate using productivity efficiency and production elements. With the composite rate, manhour estimating can be applied with equal validity to any electrical installation job . . . in any location.

Areas covered in 15 Sections include: Conduit, Boxes and Fittings; Service and Feeder Wiring; Branch Circuit Items; Lighting Fixtures; Panelboards and Cabinets; Safety Switches; Hangers and Fasteners; Underfloor and Buss Ducts; Starters and Motors; Mounting Transformers; Outside Construction; Underground Duct and Cable; Communication and Signal Systems; Demolition; Excavation and Concrete; Technical Information.

order from

GULF PUBLISHING COMPANY

P. O. Box 2608 • Houston 1, Texas

for the
LONG PULL
use
Y-ER EAS
Wire Pulling Lubricant
Only Y-ER EAS has all these features
• Creamy, non-corrosive lubricant. Never greasy or messy.
• Prevents sticking or setting. Specially helpful on saddles and turns.
• Does not run back on cables.
• Never harmful to hands or clothing.
• Permanently non-harmful to cables or conduit.
Write for descriptive booklet
GIVES THE SLIP TO-
Lead, Rubber, Braid or Synthetic Covered Cables
UL
At All Leading Electrical Supply Houses
ELECTRO COMPOUND CO.
4148 W. 150th St., Cleveland 35, Ohio

INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

July 1960

(Continued from page 103)

Micro Balancing, Inc. 9

Joslyn Pacific in following cities:
Los Angeles ..... LUdlow 7-4251
San Francisco ..... UNderhill 1-7313
Seattle ..... MAin 3-1957
Portland ..... CApitol 3-5127
Phoenix ..... ALpine 2-1245
Salt Lake City ..... EMpire 3-2084
Denver: Hamilton Assoc. ..... CHerry 4-1505

Moloney Electric Co. 10, 11

Garland Affolter in following cities:
San Francisco ..... EXbrook 7-1800
Los Angeles ..... MAdison 4-1864
Portland ..... CApitol 3-7349
Seattle ..... MUtual 2-4950
Denver: Hamilton Associates ..... CHerry 4-1505
Salt Lake: Riter Engineering ..... EMpire 3-7933

Morrison-Pelsue 99

Sold by Graybar Co.—All offices.
Denver ..... RAce 2-2834
North Hollywood: A. F. Johnson ..... STate 7-8544
Salt Lake City: W. H. Pingree Co. ..... EMpire 3-6731
Los Angeles: Golsan Co. ..... RIchmond 7-5486
Spokane: Tinling & Powell ..... TEmple 8-8276

National Supply Co., Tubular Products Div. 31

San Francisco, Branch office ..... DOuglas 2-2975
San Francisco: Arthur & Allen ..... YUkon 2-3483
Los Angeles: Murphy-Hain ..... ANgelus 8-3521
Denver: Fred E. Staible & Sons ..... TAbor 5-3991
Salt Lake City:
Fred E. Staible & Sons ..... INgersol 6-2461
Seattle: J. H. Stumph ..... MUtual 2-5232

Newport News Shipbuilding & & Dry Dock Co. 36

Ohio Brass Co. 32

San Francisco ..... SUtter 1-5060
Los Angeles ..... MAdison 4-8555
Seattle ..... MAin 2-3842
Denver ..... SKyline 6-7722

Orangeburg Mfg Co. Inc. 12

General Electric Supply and Graybar Electric Co. all principal cities
Santa Ana ..... Lincoln 4-1195
Seattle ..... MUtual 2-4566
Newark, Calif. ..... SYcamore 3-2200

Pacific Gas and Electric Co. 37

San Francisco ..... SUtter 1-4211

Pennsylvania Transformer Div. 27

San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: John G. Corrin ..MAdison 2-0830
Seattle: Fred W. Carlson ..... ATwater 4-4630
Phoenix: Roy E. Coulson ..... Windsor 3-8935
Denver: Peterson Co. ..... DExter 3-5434
Salt Lake City: Clarence W. Silver. ELgin 5-5378
Portland:
Fred W. Carlson & Associates. CApitol 8-3798
Boise, Ida.: Clarence W. Silver Co. 2-6947
Albuquerque:
Williamson Sales Co. ..... ALpine 6-6617

Phelps-Dodge Copper Products Corp. 64

San Francisco ..... EXbrook 2-7379
Los Angeles ..... RAymond 3-1311 and PArkview 1-1191
Seattle ..... MAin 3-6790
Denver ..... CHerry 4-9291 and CHerry 4-9292

Porta House 101

Oakland ..... OLympic 2-7237
Sacramento: Robert Cronin ..... GIlbert 3-8543
Portland: Bardi Gen. Contractors ..... PRospect 5-4354
Los Angeles: Constructors Supply Co. ..... LUdlow 3-4158
Los Angeles: Ball & Black ..... ANgelus 9-7586
Santa Ana: Blystone Equip. Co. Kimberly 2-3918

Precision Multiple Controls 101

San Francisco:
Wrathall & Krusi ..... SUtter 7-3593
Los Angeles: Industrial Engineering & Equip. Corp. ..... DUnkirk 1-1281
Denver: Jim Dawson Co. ..... ALpine 5-7194
Salt Lake City:
Leonard M. Slusser ..... ELgin 5-2322
Vancouver, Wn.:
Bill Horning Sales ..... OXford 4-4475

Preformed Line Products Co. 38, 39

Palo Alto: 600 Hansen Way ..DAvenport 4-2561
San Francisco: K. M. Kyals Co. ..... YUkon 2-5510
Los Angeles: Earl S. Condon Co. DUnkirk 1-3951
Seattle: Shaffer & Nelson Inc. ..... MUtual 2-0186
Portland: Shaffer & Nelson Inc. BElmont 4-7437
Salt Lake City: Shaffer & Nelson Inc. ..... Hunter 4-3382
Spokane: Shaffer & Nelson Inc. ..FAirfax 7-9528
Denver: Peterson Co. ..... DExter 3-5434

Reliable Electric Co. ..... 2nd Cover

Palo Alto, Calif.: D. B. Evans DAvenport 5-0230
Los Angeles: H. C. Mitchell, Jr .GRanite 8-3418
Mercer Island, Wn.: D. J. Smith ..ADams 2-8378

Republic Steel Corp. 33

San Francisco ..... GArfield 1-0977
Los Angeles ..... MAdison 4-5144
Portland: Shaffer & Nelson Inc. BElmont 4-7437
Seattle: Shaffer & Nelson Inc. ...MUtual 2-0186
Spokane: Shaffer & Nelson Inc. .FAirfax 7-9528
Denver: C. D. Bolt Co. ..... SKyline 6-9421

Rome Cable Div. of Alcoa 8

Los Angeles ..... RAymond 3-3631
San Francisco ..... VAlencia 6-3580
Seattle ..... MAdison 4-3017
Salt Lake City ..... ELgin 9-8811
Denver ..... KEystone 4-0533

Royal Electric Corp. 62

Los Angeles: Eckert-Lloyd Co. ..Richmond 7-9655
San Francisco: Eckert-Lloyd Co. ..HEmlock 1-5792
Seattle: Northwestern Agencies ..... MAin 3-8882
Portland: Northwestern Agencies CApitol 7-0434
Phoenix: Wm. Benndorf ..... CRestwood 7-1662
Denver: Hyde Electronics Co. ..... WEst 6-3456

Sangamo Electric Co. 51

San Francisco: L. A. Nott ..... HEmlock 1-4738
Los Angeles: (Factory Sales) ..DUnkirk 7-2336
(Time Switches) ..... ANgelus 8-6771
Seattle: T. R. Wood ..... MAin 3-8204
Denver: Mt. States Machinery ....CHerry 4-7421
Phoenix: J. E. Redmond Co. .... ALpine 4-8471
Portland: R. L. Schoenberger ....CApitol 3-8742
Butte: R. E. McDonough ..... Butte 2-5447
Tucson ..... AXtel 8-4801
Albuquerque:
Gorman Engineering ..... CHapel 7-1596
El Paso: Gorman Engineering ..KEystone 2-3449

Southern California Edison Co. 28

Los Angeles ..... MAdison 4-7111

Square D Co. 13

Los Angeles ..... CApitol 1-1171
San Francisco ..... JUniper 7-4590
Seattle ..... EAst 3-1474
Portland ..... BElmont 4-8488
Denver ..... KEystone 4-6234
Salt Lake City ..... DAvis 2-5859
Phoenix ..... ALpine 8-6448
El Paso ..... KEystone 3-0544
Spokane ..... FAirfax 8-3690
San Diego ..... BElmont 3-7621
Fresno ..... AMherst 8-6268

Westinghouse Electric Corp. 24, 25, 47, 82, 83

San Francisco ..... EXbrook 2-5353
Los Angeles ..... MAdison 6-3881
Denver ..... KEystone 4-8121
Phoenix ..... ALpine 8-8621
Salt Lake City ..... ELgin 5-3413
Seattle ..... MAin 2-0808
Portland ..... CApitol 2-9151
Spokane ..... FAirfax 8-3371

STOP PROFIT KNOCKOUT...

with the

Carol®

Protected-Profits Inventory Control Plan

When business is good—*but* your profits are taking it on the chin—just look at your inventory! Dead stock on your shelves—items that are obsolete or too slow-moving—knocks out profits every time.

Profits start with *buying*—the *right* merchandise . . . at the *right* price . . . in the *right* quantity . . . and with the *right* service and cooperation to insure rapid turnover.

That's why it'll pay you to know about the **Carol Protected-Profits Inventory Control Plan** . . . a newly developed service designed to:

- **Insure maximum turnover**
- **Eliminate obsolescence**
- **Insure adequate inventory to fill all orders promptly**
- **Insure balanced inventories**
- **Protect your profits**

STOP TAKING IT ON THE CHIN . . . Ask your Carol salesman for full details on the "Carol Protected-Profits Inventory Control Plan"—or write, wire or phone Carol Cable Company, Pawtucket, Rhode Island.

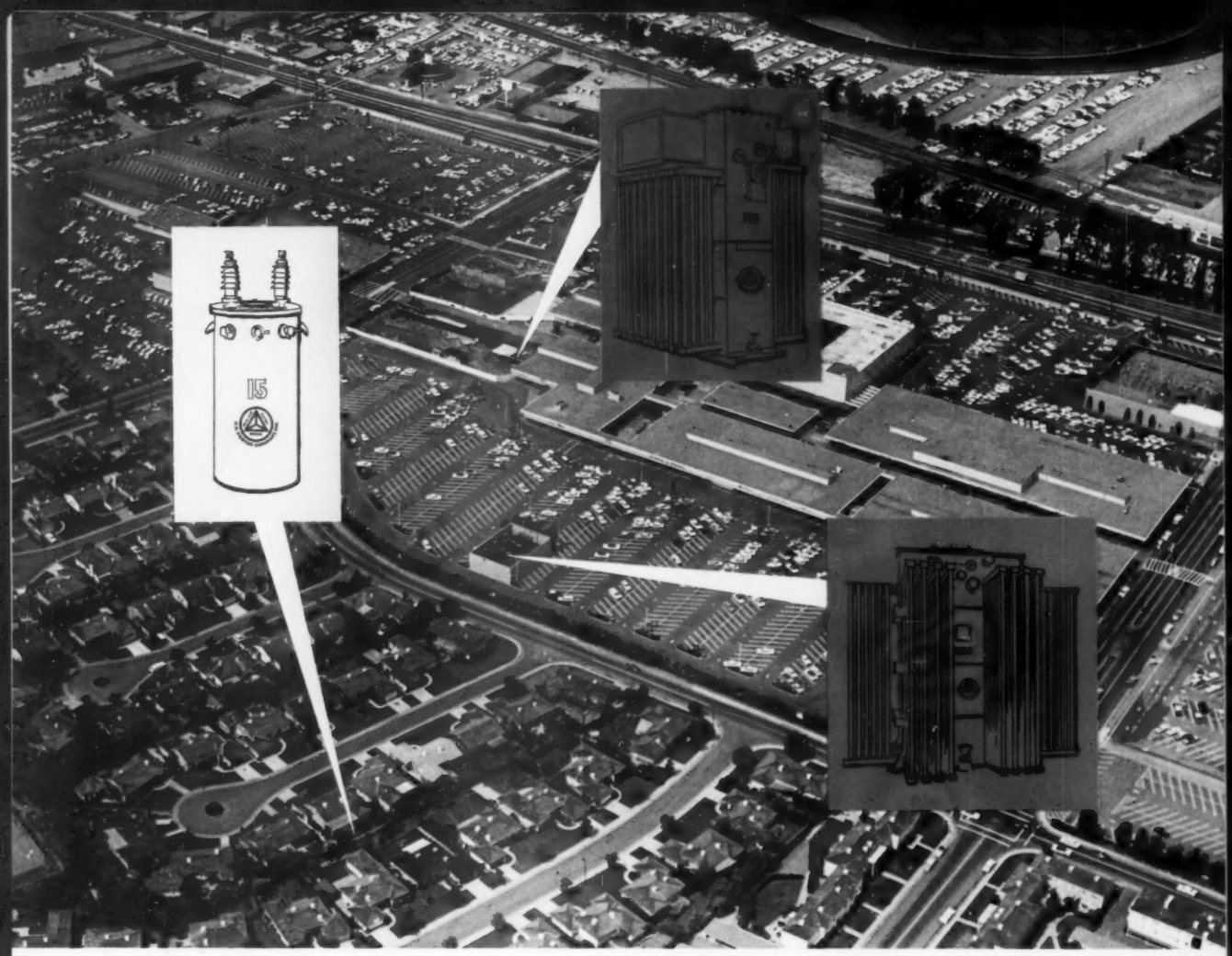
When you call for cable—call for Carol!

Portable Cords • Power Supply Cable, Types W & G • Arc Welding Cables • Cord Sets • Asbestos Types • Plastic Jacketed Cords • Thermostat Wires • And Many Others

CAROL CABLE COMPANY

Division of the Crescent Company, Inc., Pawtucket, R.I.

For phone number of closest representative see advertising index in back of book.



SYMBOL OF COMPLETE SERVICE

Delta-Star transformers are an increasingly familiar sight at utility, industrial and commercial installations throughout the West today—*with good reason.* Complete, fully-integrated manufacturing facilities... producing a full range of transformers, pole mounted, substation and dry types, through 5000 kva, single and three phase. Direct, personalized Delta-Star service on your transformer needs is provided everywhere in the West through new sales engineering offices in every major city. These new standards of production and service add new meaning for you to a respected trademark.

Delta-Star Electric Division, 1030 Washington Street, San Carlos, California
Offices at Albuquerque, Denver, Los Angeles, Phoenix, Salt Lake City, San Francisco, Seattle.

DELTA-STAR **PORTER** **ELECTRIC DIVISION**

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; in Europe, H. K. PORTER & CIE., S. A.; in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepconduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.